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THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. JULY 6, 1899. CHICAGO, ILL. NUMBER 27

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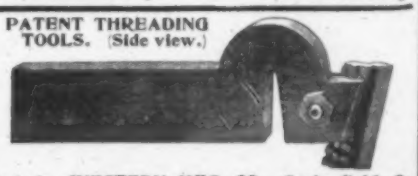

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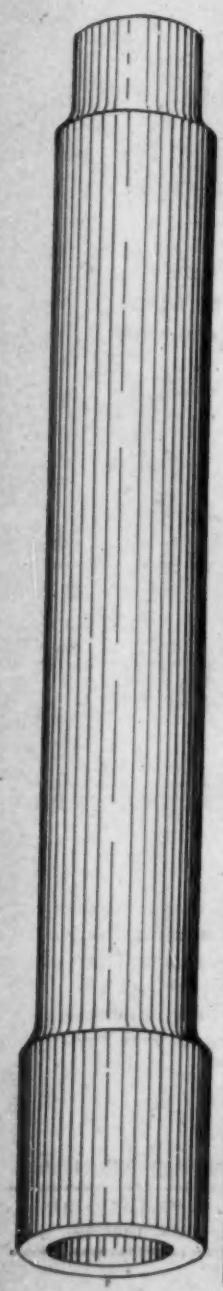

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THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. JULY 6, 1899. CHICAGO, ILL. NUMBER 27

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

The first week of the second half of the year is one of broken operation in many departments of the iron trade, but it has been marked by continued strong demand and by fully maintained or advancing prices. It is evident that the remainder of the year will intensify the scarcity of material in some lines, at least. In the Central West the shutting down of several Bessemer steel plants for a week or ten days is due almost as much to the failure to get metal as to the necessity for repairs. Meantime the strike that has stopped six furnaces at Sharpsville, Pa., will so far reduce the accumulation of Bessemer iron that would have been welcome to steel plants as a help to steady operation through the summer. The third quarter promises to show even a more strained condition of steel works operation. One furnace starting at Lorain, O., this week is the only present relief. The shut-downs by bar, sheet and tin plate mills will amount in most cases to a week at least; tin plate plants, pending the vote by Amalgamated Association lodges on a reduction in the 20 per cent demand, may be closed longer. The labor situation in general, owing to attempts to force recognition of the union in some cases, and in others to strikes over trivial causes, has possibilities of trouble that may yet have to be reckoned with. The Homestead strike so-called is a failure to begin with, and no reason is now apparent for expecting any interruption of operations. The restlessness apparent among employes in various quarters, even under the highest wages in years, may bring into summer operations more friction than has been seen in recent mid-summers, the notion prevailing that current prices have been obtained on large amounts of material. This is far from the truth. Bessemer pig iron has risen to $20, valley furnace but a most insignificant amount of $20 iron will be turned into steel in 1899. In foundry iron it is estimated that 90 per cent of the probable output for the balance of 1899 is sold. Scarcity of labor at coal and iron ore mines is noted the country over, and it is a common experience that with the unusual demand for labor in all quarters its average efficiency is less than in less prosperous times. Thus the increase in the number of active properties has not resulted in the increased output that might have been expected. The fact that crippled and practically abandoned works are being put in shape to run indicates how urgent is the still unsatisfied demand for material. Producers of Southern iron note sales of No. 2 foundry at $14.50 Birmingham and of basic at $14. Export demand, moreover, has taken a fresh start and several large inquiries have been received. Export sales are reported at nearly current prices, but many of the inquiries must be turned away unfilled. Domestic buying for 1900 delivery is increasing. In some cases to-day's quotations are the basis of these contracts; in others about $1 a ton below top prices is being realized. Buyers of both pig iron and finished material who always contract about this time for material on which deliveries reach into the following year are coming into the market week by week, but are taking only about half the usual amounts, often much less; for the balance they will place orders later in the year when the situation is clearer respecting 1900. It is now generally conceded that the present scale of consumption is measurably assured for some months into next year, and that in any event foreign business on a larger scale awaits the going after it, when home conditions change. Among the advances of the week is $1 a ton on bar iron, with a wide margin still maintained between iron and steel. Structural business is fairly swamping the mills and fall delivery is now the best promise with some. The Lake Superior ore situation begins to give tangible indications that not all the sold material will be shipped. The Gogebic range in particular is not fulfilling expectations.

PITTSBURG.

OFFICE OF *The Iron Trade Review and Industrial World.*
705 PUBLICATION BUILDING, July 5.

The summer shut-down of the mills will be of as brief a duration as possible, and will last on an average about as long for steel producers as for finishing mills, so that the supply of steel will be neither increased nor diminished by the fact, but the demand on finishing mills will be slightly accentuated by the fact that consumption of finished material will go right on in most cases. As against the slight increase in Bessemer pig iron stocks through the temporary shut-down of some Bessemer steel works come the labor difficulties in the valleys, by which some half-dozen furnaces are banked, but the loss in production on this score is not likely to amount to more than a few thousand tons.

The iron and steel market has been unusually quiet during the past week, and outside of the advance in Bessemer and foundry pig prices have remained about stationary. The indications seem to be at the present time that the second half year on which the trade is entering will see still higher prices. Furnace capacity is likely to prove inadequate to supply the full converting capacity of the steel mills, advancing perhaps further the price of Bessemer pig, and reacting on the steel market to push billets to a still higher level. Next year may see still higher prices than this year and nothing short of a marvel will keep ore producers from putting the price at such a figure that $15 for Bessemer will be rock bottom.

PIG IRON.—For the few remaining thousand tons of Bessemer which can be sold for the balance of the year high prices will have to be paid. Nothing below $20, valley, can now be done and several thousand tons have changed hands at this figure, or $20.75, Pittsburg, the freight being now 75 cents. Inquiry is very light at the present time, but it is generally believed that a considerable quantity of pig iron will have to be secured yet to keep steel mills going full. Laughlin & Co. will have two entirely new furnaces to blow in, one probably in August and the other a month later. One of these takes the place of one of the old Eliza furnaces, but is a completely new stack, and the other is an additional furnace. In foundry iron there is a heavy consumption, with only a very moderate demand, but with the pronounced scarcity sellers can secure almost any price. No. 2 foundry has sold all the way from $18.50, Pittsburg, to a shade above $19. There is scarcely any No. 1 or No. 3 changing hands, and prices on these grades are largely nominal. In gray forge the high prices continue,

but we do not have to record any further advance. We quote as follows:

Bessemer, valley furnace	$21.00		
Bessemer, Pittsburg	20 75		
No 1 Foundry	19.00	to	$ 9.50
No. 2 Foundry	18.50	to	19.00
No. 3 Foundry	18.00	to	18.50
Gray Forge, valley furnace	17 00	to	17.25
Gray Forge, Pittsburg	17 00	to	17 25

STEEL.—There is only a moderate run of light orders in the steel market. Occasional sales of a car load or a few car loads are being made, the mills not being in shape to take on anything extensive. From second hands a little steel is being sold, but the holders are well satisfied that a continuance of the present conditions is a certainty through the next few months, and are not offering any steel. We still quote the market at $33 to $34. Basic open-hearth is quoted at $40 to $42.

FERRO-MANGANESE.—The market in ferro remains unchanged at $85 for large lots and considerably higher prices for small lots.

RAILS AND TRACK MATERIALS.—The rail market is quiet, there being nothing important going except the large order for the Trans-Siberian railroad, which it is believed will ultimately be placed with the local mill. In track material the market is very firm, at former prices: Spikes, 2.20c to 2.30c; track bolts, 2.65c to 2.75c; splice bars, 1.75c to 1.90c; links and pins, 2.15c to 2.25c.

BARS.—The market for both steel and iron bars is very firm. Steel bars are all of 2c, and even higher prices are paid for small lots. Iron bars are 1.95c for desirable orders and in other cases sell at considerably higher figures.

STRUCTURAL MATERIAL.—The structural market is very firm and the usual run of business is being booked. Prices remain as follows: Beams and channels, 3 to 15 inches, 1.75c; 18 to 24 inches, 1.85c; tees, 1.80c; zees, 1.80c; angles, 1.75c., and universal mill plate, 2.35c.

PLATES.—As high as 2.75c has been paid for prompt delivery tank plate, and for anything this side of September 2.50c would probably have to be paid. For later deliveries prices are on the following basis: Tank, 2.40c; shell, 2.50c; flange, 2.65c; fire box, 3½c to 4c. The universal plate mill purchased by the Carnegie Steel Co. from the Bethlehem Iron Co. some months ago is nearly ready for operation, and some of the machinery is being tried. It will probably be put in operation by the middle or latter part of the month.

PIPES AND TUBES.—The new National Tube Co. is in possession of the business, but the administration of affairs is proceeding as formerly, no changes having been made as yet. The market is very firm, and in merchant pipe, casing and tubes it is very difficult to get deliveries in less than two or three months, and in some cases buyers have to wait four months. Prices are unchanged as follows: Merchant pipe, base discount, 50 per cent and additional discounts two 10's for less than carloads and two 10's and 5 for carloads, with free delivery on the latter within the prescribed territory; lap weld casing, 40 for screw and socket joint and 35 for inserted joint, with 5 per cent additional on carload orders; boiler tubes, 1¼ to 1½-inch, 40 per cent; 1¾ to 2½-inch, 50 for iron and 55 for steel; 2¾ to 6-inch, 55 for iron and 57½ for steel; extra 5 per cent to dealers.

SHEETS.—The sheet mills are making the shut-down as brief as possible. Some may get started this week, while only a few will not be in operation Monday next, so that the average shut-down will be for scarcely a week. The market continues firm at former prices, 2.95c to 3c for No. 28, and heavier gauges higher in proportion. Galvanized is strong at 70 and 10, and if the expected advance in spelter comes will likely be higher.

SPELTER.—The market has not regained strength as expected, and prime Wsetern grades continue to be held at about 5.40c, Pittsburg.

OLD MATERIAL.—Exceptional conditions prevail in the scrap market, and prices are very irregular, buyers in some cases having to pay fancy prices owing to the urgency of the case, so that it is very difficult to summarize the market properly. We note a case where a dealer purchased a round lot of a certain variety at $15 and within three hours sold it at $17.25, both transactions having been made in his office. We quote the market as follows: New melting stock, $17; old steel rails, mixed lengths, $16.50 to $17; cut, $17; old iron rails, $21 to $22; wrought iron scrap, $17 to $18; cast borings, $9 to $9.50, net, Pittsburg; busheling scrap, $12.50 to $13, net; car wheels, $17.50, gross; cast scrap, $16.50 to $17, gross; wrought turnings, $11, net, Pittsburg.

COKE.—The coke market continues very firm, without quotable change. Standard Connellsville furnace coke is bringing all of $2.25, while foundry and crushed are quoted at $2.15 to dealers and $2.30 to consumers.

CHICAGO.

Office of The Iron Trade Review and Industrial World,
1522 MONADNOCK BLOCK, July 5.

The extreme sensitiveness of the market continues. The volume of business is not large; in fact it cannot be large, owing to the reluctance or inability of producers to increase their engagements, but the comparatively small trade that is current is enough to keep values at their lately acquired height or to push them along still further. It has become very apparent during the past few days that there is a distinct difference between quotations for immediate delivery and those for shipment in the future. Quick shipments are commanding a sharp premium. This condition has been present for some time but it is now in evidence to a greater extent than ever. Under ordinary, or normal, conditions, the trade of the past week would not be considered large. It now appears of larger than actual proportions from the ease with which values are influenced. The holiday is in a measure ignored. Inquiries keep coming in to sellers and they are mainly for early needs. The policy of consumers is to buy into the future less freely than formerly. They seem to be consuming as heavily as ever, but are loading up at present prices only to perhaps one-half the usual extent.

PIG IRON.—The past week has been inactive in pig iron, as activity is ordinarily understood, but prices are higher. The large consumers of pig iron are not hampered to any extent by an inability to obtain iron for immediate needs, but there are few melters who are paying prices that might be considered as fancy by some, because they have met the alternative of taking or refusing the material. They have to have it. If they cannot obtain the iron from the furnacemen who had been supplying their needs, they are compelled to search the market until they find a seller and then pay his price. These are the surface conditions. It is recognized here that values are far above the safety point but no easement of the severe conditions is in sight. Revised quotations are as follows:

Lake Sup. Charcoal	$20 50	@	$23 00
Local Coke Fdy. No. 1	19 50	@	20 00
Local Coke Fdy. No. 2	19 00	@	19 50
Local Coke Fdy. No. 3	18 50	@	19 00
Local Scotch Fdy. No. 1	19 50	@	20 00
Local Scotch Fdy. No. 2	19 00	@	19 50
Local Scotch Fdy. No. 3	18 50	@	19 00
Southern Coke No. 1	18 65	@	19 65
Southern Coke No. 2	18 15	@	19 15
Southern Coke No. 3	$17 65	@	$18 65
Southern No. 1 Soft	18 65	@	19 65
Southern No. 2 Soft	18 15	@	19 15
Southern Silveries	18 00	@	18 25
Jackson Co. Silveries	22 50	@	23 00
Ohio Strong Softeners	20 00	@	21 00
Alabama Car Wheel	19 50	@	20 00
Malleable Bessemer	20 00	@	20 50
Coke Bessemer	20 00	@	20 50

BARS.—Trade in bars is perhaps a little more quiet this week, but does not seem to have radically changed its character. Sales are being made of a volume that just about represents the producing capacity. In the past, there have been alternating periods of large buying and of marked dullness.

The present trade is neither the one nor the other. Considering the fact that at this period of the year dullness is to be expected ordinarily, the current trading seemed to be viewed as a mark of activity. The agricultural implement men are buying quite generally, though not to the extent, measured in tonnage, to which they have been accustomed. They apparently do not wish to put all their commercial eggs in one basket. Iron bars are $1 per ton higher, the minimum quotation being 1.85c, Chicago. Steel bars also are somewhat stronger and are this week quoted at 2 to 2.10c.

STRUCTURAL MATERIAL.—Trade has been fairly large, one transaction being for 600 tons of shapes for a local building. Values are unchanged, as follows: Beams, 15 inches and under, 1.90c to 2c; 18 inches and over, 2c to 2.10c; angles under 3 inches and over 6 inches, 2c to 2.10c; 3 inches to 6 inches, 1.90c to 2c; sheared plates, 2.65c to 2 70c; universal plates, 2.65c; tees, 1.95c to 2c; zees, 1.95c to 2c. Small lots from store are quoted ¼c to ½c higher.

PLATES.—Store prices—and all others are nominal for current delive y—are a little higher again this week. Supply cannot be maintained on a basis adequate to demand and prices keep ascending. Several consumers here have been compelled to shut down because of their inability to obtain needed material. Tank steel from stock is now quoted 3c to 3.20c. Mill shipments, Chicago delivery, are quoted as follows: Tank steel, 2.75c; shell, 2.85c; flange, 2.95c; marine, 2.95c; fire box, 3c to 5c, according to brand.

MERCHANT PIPE.—For both iron and steel pipe there is good demand. The former is quoted $28, Chicago, and the latter at 50, two 10's and 5 per cent.

SHEETS.—Some improvement has been noticed in the demand for sheets, especially for galvanized, the call for which is very active. Prices are without quotable change. Galvanized is 70 and 10 from mill and 70 from store. Black sheets are 3c to 3.10c for No. 27.

MERCHANT STEEL.—At the advances made early last week there has been good buying. Manufacturers are not infrequently making the question of delivery of importance paramount to that of prices. We quote as follows: Smooth finish tire steel, 2.45c to 2.50c; smooth finish machinery steel, 2.70c to 2.75c; spring steel, 3.20c to 3.30c; tool steel, 6c to 7.50c; special, 10c and upwards.

BILLETS AND RODS.—The billet market here is quiet and without feature. Nominally the price of Bessemer billets is about $30. Rods are selling in small lots at about $42.

RAILS AND TRACK SUPPLIES.—Inquiries are numerous for standard rails, but almost invariably deliveries are asked for earlier than mills can respond. Failing to meet on the question of deliveries, many of these inquiries do not lead to transactions. The local mills are running steadily on their old contracts. Standard rails are unchanged at $30 to $32; light rails, $32 to $37. Splice bars are 1.70c to 1.75c; spikes, 2.25c to 2.35c; track bolts, 2.85c to 3.25c.

OLD MATERIAL.—Business seems to have settled down to a good steady gait. One of the largest producers of scrap locally, which had made large previous sales of old material, was a seller again this week for about 3,000 tons of steel scrap, which takes all its available stock. Prices continue strong, especially for the better grades. We quote as follows:

Old iron rails, gross	$18 00@$18 50	Axles, net	$18 00@$19 00
Old steel rails, long, gr.	15 00@ 15 25	Cast borings, net	6 50@ 7 00
Old steel rails, mixed	14 25@ 14 50	Wrought turnings, net	7 50@ 8 00
Old wheels, gross	15 00@ 15 50	Axle turnings, net	8 25@ 8 75
Railroad forge, net	15 50@ 16 50	Mixed steel, gross	9 50@10 00
Dealer's forge, net	12 00@ 12 50	Stove plates, net	7 00@ 7 50
No. 1 mill, net	8 75@ 9 25	Heavy melting steel, gr	11 00@12 00
Heavy cast, net	11 00@ 11 50	Old iron splice b., net	17 00@17 50
Malleable cast, net	8 00@ 8 50		

WIRE AND WIRE NAILS.—Sales were unusually large late last week. The rumor had been current in buying circles that an advance in prices was to be made July 1 and this rumor induced considerable buying in anticipation, but prices remain unchanged. Wire nails are quoted at $2.60, f. o. b. Chicago, in car lots, and $2.70 less than car lots. On wire current quotations are as follows: Plain annealed wire, $2.45; painted barb wire at $2.70; galvanized barb wire, $3.20.

CLEVELAND.

OFFICE OF *The Iron Trade Review and Industrial World.*
27 VINCENT ST., July 5.

The ore movement from the Lake Superior region in June was the largest in the history of the trade. The official figures received to day from all shipping ports, except Gladstone on Lake Michigan, show a total of 2,560,160 tons, or nearly 300,000 tons more than the June total, 1898. The total shipped to date is thus 4,680,217 tons, without Gladstone, or 100,000 tons more than was shipped from all ports to July 1, 1898, notwithstanding that there were no April shipments this year and that comparatively little ore was moved in the first week in May. Ore has been brought down the past month at a pace suggesting that every shipper felt impelled by some pressing necessity to move every pound possible before July 1. This has resulted in pushing up vessel rates to $1 from the head of the lake—though in the last two or three days business has been done at 90 cents—and 75 cents from Escanaba. Yet it must be evident that the June pace, with stockpiles furnishing an important part of the total, cannot be long maintained. The ore is not to be had at any such rate for long, and as stockpiles come to be pretty well cleaned up at the end of the present month, it will be found that the ore taken direct from the mine will not be sufficient to sustain the freight market in the way some oversanguine vessel owners have calculated. It is significant that of the important shipping ports, Ashland was he only one that showed a falling off in June from the corresponding month of last year. This fact taken in connection with indications already given that some Gogebic properties will not reach early estimates of production, raises a questions as to the ability of the Gogebic range, for years the backbone of the old-range Bessemer ore supply, to keep up its old-time rate. With every incentive to reach their maximum this year, if Gogebic properties fall short the fact may be taken as indicative of a condition bound to have an important bearing on the entire Bessemer ore situation. In the past week additional purchases of Mesabi ores have been made by some interests to whom notification came that they were not likely to get the full amount of their purchases of old-range Bessemers.

PIG IRON.—The close connection Bessemer furnaces have been making on shipments to steel works of late has come to such a point of uncertainty for some of the latter that they have closed down for a few days in this holiday week. The Ohio plant at Youngstown, of the National Steel Co. is down, as are also the steel plants at Bellaire and New Castle. Some of the furnaces are from two to four weeks behind on shipments, and several cases are reported in which, owing to bad working, output has fallen considerably short of the Bessemer Association's estimated production. No inquiries have come to the association recently, the conditions being too well known to steel works, and it is evident that the full output of Central Western steel works cannot be reached in the second half of the year. It is reported that $20 at furnace has been paid for Bessemer iron in the past week. Foundry irons are well sold up for 1899 and some further buying for 1900 has taken place, though usually not at top notch prices made on third and fourth quarter metal. We continue quotations, transactions in No. 2 foundry ranging from $18 to $19 at valley furnace. It is expected that the first of the Lorain Steel Co. furnaces will be started to-

day. The strike at the six Sharpsville furnaces appears to be in part for higher wages and in part from an announced determination of the men not to work on the 4th of July. Now that the celebration is over it is probable that furnace operators will be able to get at an understanding of the men's demands, if they have any, and start up again. All the furnaces have been inactive since Saturday.

Bessemer	$20 75	Valley Scotch No. 1	$19 75@20 75
No. 1 Strong Foundry	19 75@20 75	Valley Scotch No. 2	18 75@19 75
No. 2 Strong Foundry	18 75@19 75	Gray Forge, valley	17 00@17 50
No. 3 Foundry	17 75@18 75	Lake Superior Charcoal	22 00@22 00

FINISHED MATERIAL.— Monday morning's mails are reported to have been the heaviest in the history of local iron and steel houses. Specifications on contracts are coming in at a great rate and new buying for immediate wants is active. Some little structural business has been closed, including the addition to the Western Reserve building. One mill is reported to be quoting $1 a ton above the 1.75c Pittsburg basis for beams and channels because it is indifferent to orders and is filled for fully two months. The Republic Iron & Steel Co. has advanced bar iron to 1.75c, carload lots, and 1.90c less than carload lots, and is still quite conservative when the basis for steel bars is considered. On heavy sheets—No. 16 and heavier—an advance of $5 a ton has been made by local sellers, and about $4 a ton on lighter gauges. From store No. 27 black sheets are now quoted 3.30c, as against 3 10c a week ago. The high prices for steel seem to have cut off part of the roofing trade. At least preparations of roofing manufacurters are not on the usual scale in steel sheets. A number of mills are taking the full week for repairs and the demand in all lines upon jobbing houses is very heavy, high and advancing prices being no barrier.

WIRE AND WIRE NAILS.—Repairs will be made during brief shut-downs in certain departments of local plants of the American Steel & Wire Co. The intimation that an advance in prices might come on July 1 has not been realized. Considering that the season is now somewhat advanced the demand is very satisfactory. We continue to quote wire nails at $2.35 Pittsburg in carload lots to jobbers, with 50 cents a ton advance in less than carloads to jobbers. The difference to retailers is 10 cents a keg, with a probability that it will be made 15 cents. We quote smooth wire at $2.20 Pittsburg to jobbers in carload lots; painted barb wire, $2.45; galvanized, $2.95.

OLD MATERIAL.—There is a steady run of buying at the prices last quoted: Old iron rails, $21 to $22, valley mill; old steel rails, $15 to $15.50, valley; old car wheels, $16 to $17, Cleveland, gross tons; No. 1 railroad wrought scrap, $16.50 to $17, valley; wrought turnings, $10; cast borings, $9; busheling scrap, $12 to $12.50, valley; machine cast scrap, $12.50 to $13, Cleveland—net tons.

CINCINNATI.

July 3.

The demand which we mentioned last week for foundry iron to be delivered during the first six months of next year has greatly increased There have been large sales for this shipment and a number of the most extensive consumers in the Middle West have bought. This is a practical demonstration of the strength of the market and of the view that buyers have of its continued strength. It is out of the question to get at the present time soft iron for anything like quick shipmnt. One of the most significant sales that has recently been made was booked by the Tennessee Coal, Iron & Railroad Co., last week, when they sold 1,000 tons each of 2 and 3 foundry, at $14 and $13 per ton, cash, respectively, for shipment to Austria. It has been freely stated that at the present high prices export business was impossible, but here is a sale at high prices. Not only that, but the buyers take their own risk of freights, which are likely to be higher rather than lower when the time for delivery comes.

The stories that appear from time to time in the papers of increased furnace production in the South have some basis of truth, but not much, for to increase materially the output in the South it would be necessary to increase largely the present coke oven capacity, and this is something that cannot be done in a hurry. We quote f. o. b. Cincinnati: Southern coke, No. 1 foundry, $18 to $18.25; Southern coke, No. 2 foundry, $17.50 to $17.75; Southern coke, No. 3 foundry, $16.50 to $16.75; Southern coke, No 4 and gray forge, $15.75 to $16; Southern coke, mottled, $15.75 to $16; Southern coke, No. 1, soft, $18 to $18.25; Southern coke, No. 2, soft, $17.50 to $17.75; Lake Superior coke, No. 1, $19 to $19.50; Lake Superior coke, No. 2, $18.50 to $19; Hanging Rock charcoal, No. 1, $21 to $22; Jackson county silvery, No. 1, $23 to $24; Standard Georgia car wheel, $18.75 to $19.50; Hinkle, Lake Superior charcoal, $21.50 to $22.50.

PHILADELPHIA.

July 3.

The market in all lines, from pig iron down increases in strength as the mid-summer season comes on, and prices are at the top point, with a probability amounting practically to a certainty that further advances will be made. The supply of material available for delivery in the balance of the year is getting small and premiums are being paid and will continue to be paid for such pig iron and finished products as can be picked up to supply immediate needs. Something of a relief is looked for from furnaces yet to go in; but it is to be considered that all of these have sold their product for the early portion of their run, a fact indicating that consumers of iron have orders on a scale likely to require more iron than is now being made. There is not in sight any sign of even the beginning of a reaction. The advance since Jan. 1 has amounted to 75 per cent in pig iron, sales the past week of No. 2X foundry having been made at $19 to $19 50 as against $11 to $11.25 in the first week of the year. Quotations differ considerably, ranging from $18.75 to $19.50, the latter price being realized on a few lots for prompt delivery. A lower figure has been named in connection with contracts for 1900, of which a number have been made. By August, the production of pig iron promises to be increased considerably, but for the reason given above prices probably will not be affected. It is hoped by sellers as well as consumers that no substantial advances will be recorded in the balance of the year. It is realized on all hands that they would be dangerous. The steel market continues on a $34 basis, or twice the January price, with the scarcity of material more and more emphasized. The way in which demand for finished material has kept up has surprised the entire trade. But there is no sign of a let up, the inquiries this week starting out in even increasing volume. There is at the same time a large amount of postponed business, neither mills nor jobbers being able to take care of it. Every mill is on that can run, including not a few that have been started up from long idleness and that are in an uncertain state, liable to break down any day. We quote tank plates at 2.50c to 2.65c; refined iron bars at 2c to 2.10c; steel bars at 2.25c to 2.50c; No. 27 black sheets at 3.10c to 3.25c; beams and channels at 1.85c for 15-inch up to 2c.

Stockholders of the Thomas Iron Co., of Hokendauqua Pa., have received a circular calling for options in favor of a Philadelphia syndicate, at a price reported to be $80 a share. All the large holders have signified their willingness to sell at the figure named. The company has a capital of 50,000 shares of $50 par, the money for the redemption of the last of the bonded indebtedness being now in bank. It is reported that B. F. Fackenthal, Jr., the president, will continue at the head of the new company.

The Charlotte furnace, at Scottdale, Pa., which has been operated under lease by Corrigan, McKinney & Co., Cleveland, will undergo many improvements. The lease expires next May, but a five-year renewal has been secured. The improvements will consist of two new stoves, much larger than the present ones; a new steel hoist, and a hoisting engine; a new and larger cast house, etc.

The Morgan Engineering Co., Alliance, O., has booked an order for various large tools, placed with the concern by Hugh Hayakana, of the Imperial Steel Works, of Tokio, Japant

THE IRON TRADE REVIEW
AND
INDUSTRIAL WORLD.

DEVOTED TO MACHINERY, METAL-WORKING AND FOUNDRY TRADES AND IRON AND STEEL MANUFACTURE.

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JULY 6, 1899.

THE TARIFF AND THE TRUSTS.

In the midst of the depression of 1893–97 we had frequent examples of the *reductio ad absurdum* of the anti-protection doctrine. While the country was suffering most keenly from the threat of radical reductions in the tariff—reductions proposed with the avowed intention of cheapening prices and increasing imports — the assertion was iterated and reiterated that the protective policy was responsible for the depresion. It had stimulated home manufacture to such an extent, we were told, that industries had multiplied inordinately and there followed the inevitable glutting of markets, production beyond the country's power to consume, and consequently falling prices, idle workshops and the train of misfortunes that followed. There was utmost disregard in this argument for the fact that protection advocates had always claimed that protection would increase home competition and thus reduce domestic prices; and the same disregard for the claim free-traders had made the corner-stone of their theoretical argument, namely, that protection raise prices to the consumer.

We recall these inconsistencies as we read the comments that have filled the newspapers in the past 10 days, on Mr. Havemeyer's statement before the Industrial Commission, that the tariff is the mother of trusts. Saying nothing of the two monumental trusts which the tariff has not made—the Standard Oil Co. and the American Sugar Co., the former's product being admitted free while that of the latter pays only about 3½ per cent ad valorem duty—how will Mr. Havemeyer and those who agree with him square their claim with that of the makers of consolidations, which he indiscriminately calls "trusts"? The latter have been saying that the consolidations were a natural outcome of the competitive regime; that competition had brought prices so low that the companies were compelled to seek the economies possible through consolidation, as a recourse against the evils of the individual system.

There is a vast difference between the statement that a protective tariff "fosters monopoly" and the statement of the combine makers that protected industries have so reduced prices in the struggle for business that they are compelled to get together to save themselves. It has been almost an axiom in American economics that protection is the mother of industry. But the later teaching would have us know that the trust is the good mother that rescues it from the fate brought upon it by an over fostering tariff. Certainly it is time to fix the status of the tariff in all this. It was accused in the United States Senate in 1893 of being the cause of the Homestead riots and of reductions in wages, evidently on the ground that if there had been no tariff and no protected industries there would have been no wages to dispute about. Perhaps what Mr. Havemeyer means is that if there were no industries, the fruit of protection, there would have been none of the material out of which trusts are made.

EXCELLENT EXPORT SHOWING.

The May statistics of iron and steel exports complete an 11 months records and make possible a close approximation of the trade of the fiscal year ending June 30. The table below, which gives May shipments abroad in gross tons, and the total for 11 months, as compared with corresponding periods in the preceding fiscal year, makes a gratifying showing of increase. For the items enumerated the total in the 11 months is 955,683 gross tons, as against 628,165 tons from June, 1897, to the end of May, 1898. There was a good increase in pig iron, and a notable increase in steel bars, steel rails, wire rods, billets, sheets and plates, wire and wire nails:

EXPORTS OF IRON AND STEEL FROM THE UNITED STATES—GROSS TONS.

	May.		June.—May.	
	1898	1899	1898	1899
Pig iron { ferro	397	.....	7,912	495
Pig iron { all other	9,773	23,327	215,014	283,614
Scrap	7,550	10,228	50,048	83,792
Bar iron	340	1,101	4,370	9,457
Steel bars (not wire rods)	1,546	4,305	14,435	30,988
Iron rails	325	49	2,685	11,759
Steel rails	31,704	22,325	186,222	246,583
Billets, ingots and blooms	2,026	2,819	11,951	44,451
Hoop, band and scroll iron	135	49	1,473	2,884
Wire rods	513	2,687	13,239	22,822
Iron sheets and plates	373	564	3,751	6,069
Steel sheets and plates	2,342	4,988	10,453	46,387
Tin plates, terne plates, and tagger's tin	1	5	8	88
Structural material	2,910	4,442	29,316	43,536
Wire	7,401	12,107	52,369	87,073
Cut nails	1,097	1,066	13,640	13,942
Wire nails	1,184	2,401	9,507	19,161
Other nails, including tacks	114	170	1,752	1,982
	69,973	91,933	628,165	955,683

The table does not include the item of "pipes and fittings," in which there was a large gain. Unfortunately this item includes both cast iron and wrought pipe; but from what is known of operations in this line it is safe to say that the gain may be accounted for by the greatly increased export of wrought pipe. The value of the "pipes and fittings" exports for 11 months ending May 31, 1899, was $5,330,803, against $2,741,009 in the corresponding period of the previous year, a gain of 100 per cent. The table above also leaves out car wheels and castings, and the iron and steel in agricultural implements, cars, vehicles, cycles and the large tonnage of machinery which has gone abroad in the past year. These, with the June tonnage in all iron and steel products, will undoubtedly bring the year's exports up to the equivalent of close to

1,300,000 tons. Reduced to a pig iron equivalence this represents over one-eighth of the entire pig iron output of the United States in the calendar year 1898.

The value of all iron and steel exports from the United States in the 11 months ending May 31, 1899, including machinery and hardware, was $84,873,842, an increase of 33⅓ per cent over the $63,235,029 valuation for the corresponding 11 months in 1897-98. For the corresponding 11 months in 1896–97 the total value was $52,187,175.

It need scarcely be said that the concentration of control of the iron trade in the hands of strong companies points to the steady development of the export business in the way that the American Steel & Wire Co. has exemplified in its special products.

A town in Ohio paid $32,000 to a foundry to locate there. That was only a short time ago. Now the foundry is in the hands of a receiver. Beware of bonuses.—Exchange.

A bonus may secure an industry but it cannot insure success. Ability to talk an industrial proposition so that local interest and local capital are enlisted does not necessarily imply ability to manage the industry seeking a new home and "funds for moving expenses." It is a mistake, too, to think that capital, even abundant capital, is any guaranty of success. The industries that have succeeded have not done so because of the abundance of capital available for pushing them, though capital is necessary, nor because of location or other natural advantages, all of which are good. Management is the secret. If we were to name the three essentials of success in the conduct of industry they would be management first, management second, management last. Change of scene does not get it. The givers of bonuses may get shops and an addition to population, but with all their getting let them see to it that they get management.

Personal.

A. B. Farquhar, of York, Pa., sailed last week for Havana, in the interest of the implement trade of his company in Cuba.

J. A. Long, for many years secretary and general manager of the Akron Iron Co., Akron, O., died at his home in that city on June 28, of heart disease. He was 62 years old.

J. Linn Rodgers, of Columbus, O., private secretary of Gov. Bushnell, has accepted the European agency of the Buckeye Malleable Iron & Coupler Co., of Columbus.

Adolph C. Schroeder, of Kiel, Germany, a manufacturer of ship building supplies, was in Pittsburg last week. He said that general business in Germany is very active and that the demand in Europe is rapidly expanding, especially in iron and steel lines.

Samuel Marston, one of the chief engineers of the Northeastern Steel Co., Ltd., of Middlesbrough, Eng., has been in Pittsburg recently to visit steel works preliminary to developing plans for the extension of the famous plant in the Cleveland district.

Chas. Ziegenfuss, superintendent of the Juragua Iron Co., after a stay at South Bethlehem, has gone to Cuba. His brother, Dr. W. Ziegenfuss, of South Bethlehem, will be associated with him. The organization of the Cuban Steel Ore Co., just incorporated at Camden, N. J., will be followed by the building of six miles of railroad, the surveys for which Mr. Ziegenfuss will have made at once.

John W. Gates, chairman of the American Steel & Wire Co., has been appointed by Gov. Tanner commissioner for Illinois at the Paris Exposition.

BUFFALO Furnace, Buffalo, N. Y., started up June 28, after re-lining.

Advances in Foundry Prices.

In the early stages of the present advance in pig iron, and at a time when a 10 per cent advance in molders' wages was being agitated generally, many foundries having granted it, effective May 1, there were statements that founders were not getting advances commensurate with the increased cost of materials and labor. Some of them complained that they were paying the advanced wages and the higher prices for a portion of their raw material and still sending out castings on old contracts, so that the prosperity in the general iron trade proved to them a real hardship. It is evident that this condition has changed and that the foundry trade has caught step with conditions surrounding it. *The Iron Trade Review* has addressed inquiries to a number of foundry firms in different parts of the country, asking what advances have been made on recent contracts for castings, whether long-time contracts are being made for castings on the basis of current prices, and whether there are any indications of a curtailment of the demand for castings because of high prices. It would appear that the advance over prices prevailing in the latter part of 1898 and the early weeks of 1899 has been fully 50 per cent. In April the upward movement began to be felt in the foundry trade, but it was very conservative and ranged from 10 to 25 per cent. In the past three months there has been a more rapid adjustment to the new basis for pig iron. Some of the replies to our inquiries are given below. Others will follow:

Some Curtailment of Demand for Malleables.

The Union Malleable Iron Co., Moline, Ill., F. W. Gould manager, writes as follows:

"We have sold our entire output up to July 1, 1900, at an advance of about 25 per cent over last year's prices To your question relating to check upon consumption because of advance in price of pig iron we reply, most assuredly yes. The implement and vehicle manufacturers believe there will be a considerable decrease in business and accordingly their contracts with us are smaller than for last season."

No Check on Contracts for Grey Iron Castings.

J. G. Sadlier, of the Springfield Foundry Co., Springfield, O., says:

"Within the last 30 days our company has not done very much in the way of making contracts for castings. We have adjusted contracts of our regular customers generally to conform with the advance in the price of labor and material. For such work as we are now taking on, ordinary machine castings, we are contracting at 3 cents per pound, and architectural castings at 3 cents to 3¼ cents. We do not find that the advance in pig iron is having any tendency whatever to check the consumption of gray iron castings. We are receiving large orders right along from our customers, and our foundry is running full force full time. We have on our books all the time large orders for castings."

Foundrymen Bearing Part of Increased Cost.

Concerning conditions in Cleveland as reflected in the heavy foundry trade, Mr. N. P. Bowler, of Bowler & Co., writes as follows:

"In compliance with your request I give you a few prices of castings of this date (June 30): Rolling mill castings, 2½c; machinery castings, 2⅝c to 2¾c; pulleys, common, 3c to 3½c. This is an advance from April prices. The orders for castings from our customers are too imperative to be checked by any reasonable price that may be asked. The foundrymen of this city are bearing part of the increase of material and labor, and a further increase in their prices seems to be a

necessity before very long. The price of castings through 1898—for machinery, architectural and heavy kinds—averaged about $35 per ton of 2,000 pounds. Every foundry now seems to be busy and most manufacturers think it will keep so for a year or so."

Unable to Meet the Demand.

A New England jobbing foundry, writing *The Iron Trade Review* under date of April 25, commented as follows on the conditions then existing:

"Our business has increased very rapidly and we have advanced prices a good deal We were melting about 55 to 60 tons per day the first of the year and have increased it to about 80 tons per day. We make all kinds of castings from small work weighing part of an ounce each up to castings weighing many tons each. On low priced work made largely of scrap iron for which we formerly got $1 to $1.50 per 100 pounds, we have advanced 30c to 50c per 100 pounds. On castings for which we got from $1.50 to $2 50 per 100 pounds, the advance has usually been from 50c to 75c per 100 pounds. On castings from $2.50 to $4 per 100 pounds we have advanced prices usually from 75c to $1 per 100 pounds, and on castings above $4 per 100 pounds, the advance has been anywhere from $1 to $3 per 100 pounds. In our opinion the outlook for trade is the best we have seen since we started business 20 years ago. We think many of the foundries have not advanced the prices as much as they should do for their own interests as well as for the good of the manufacturing business in general. We are refusing to quote on a good deal of work, as we are too busy to make it."

The same firm writes as follows under date of June 29:

"There have been heavy advances in the price of castings since April. We are not making any time contracts whatever these days, as we do not wish to tie ourselves up to do so, and we do not think others are making them to any extent. Should think the advance since April on heavy castings has been from ½ to 1 cent per pound, and on small bench work castings 1 to 3 cents per pound. We are compelled to refuse to quote at all on a large amount of work that is offered, as we are not able to supply the demand. We find the foundries in this vicinity are very busy indeed and many of them unable to meet the demands made upon them for castings. We have not seen any signs as yet of the increased cost checking consumption."

Light Grey Castings Advanced from $10 to $15 Per Ton.

O. T. Stantial, of the Illinois Malleable Iron Co., notes increasing consumption:

"Prices on malleable and gray castings have steadily been advancing to conform with the advance in pig iron and raw materials, and advance in labor, both molding and common labor. On light gray castings the advance has been from $10 to $15 per ton over the low prices ruling some time ago, and upon light malleable castings about the same advance. In our lines the advance in pig iron does not seem to have exerted any check upon consumption In fact, consumption all along the line seems to be increasing steadily. We are far behind on our orders, and have experienced very little difficulty in advancing prices, both to cover additional cost of material and labor, and also to yield us considerable better margin of profit than heretofore. What influence upon consumption a still greater advance in the cost of pig iron and material will exert it is difficult to say. It is becoming plainer every day that there is a true shortage in the supply of pig iron, and it is becoming difficult to obtain it even at ruling high figures."

An Advance of 50 Per Cent Since December.

The Dobbie Foundry & Machine Co., Niagara Falls, N. Y., writes, July 3:

"Since December we have advanced prices on iron and brass castings 50 per cent. We are crowded with orders and the outlook for future business is good."

Writing under date of April 26 the same company said:

"The prices we received for castings in 1898 were about the same for the entire year. Since December we have made advances in prices as follows: Machinery castings, from 2c and 2½c to 2¼ and 3c; light gray castings, from 3c to 3¼c. We are melting several hundred per cent more iron than at this time last year and the outlook is that the record for this year will be the same proportion. We have more inquiries from all over the country and our export trade is good."

No Signs of a Check in Demand.

A Western Pennsylvania foundry makes this report:

"In the last two months there has been a greater advance in the price of iron castings than in any like period previous, averaging we would say ¼ cent per pound. The foundries seem to be more pushed than at any time. The —— Co. gave out a small order for four housings about five tons each, for which they paid 1.50c per pound. We have just refused an order for 200 tons of fairly easy castings, averaging 100 pounds each, for which we were offered 1.77c here, with a little fitting which would not amount to .02 cent per pound. The —— Co. have given notice they will advance their molders on July 1, so that their wages will be from $2.75 down, and this company will have to meet this rate. Outside of the skilled labor in the foundry, we pay much better wages. We see no signs of a check in the demand for new material; but in our line, which is special, this would not be so noticeable."

Brightest Outlook in Years.

Geo. McG. Morris, of the John B. Morris Foundry Co., Cincinnati, O., believes foundrymen should unite to secure material benefits from the present situation:

"The outlook for the foundry trade in general is to-day the brightest it has been for years in this section of the country. The great drawback is the failure of the foundrymen to grasp the situation and take advantage of the advances in material and labor. The stagnation of the market in all manufactured articles for the past few years has caused a clamor for work to keep the large plants in operation and consequently cut after cut in prices, until some castings were sold at a very slight advance over the cost of pig iron

"Now is the opportunity of the foundrymen to get those prices restored, the best opportunity they have had in years and will have again for some time to come. Why not embrace it while it lasts? Some foundrymen argue that they have contracted for their material for a period in advance and therefore can afford to make work at lower prices. 'What fools these mortals be!' If a man has foresight enough to take advantage of the low prices of material, he is certainly entitled to reap the benefit of the profit derived therefrom "There is another drawback in the foundry business, the easiest of all to overcome, but which through jealousy and fear seems to be the hardest. That is the unscrupulous consumer who uses one man's price to beat down the other, sometimes truthfully, but more often untruthfully This is a growing custom among the consumers of our products, and how easily it could be stopped if the foundrymen would only consult one another. Let them get together on friendly terms and they will soon learn how they are being duped.

In Cincinnati 'machinery castings' were being made in the latter part of April at figures ranging from $1.75 to $2.25, architectural castings from $1.50 to $1.90, light gray iron castings from $2.50 to $3.50. [In the last two months considerable advances have been made.] Nearly all the engine work is made by the builders themselves, who own their own foundries. There are no railroad or rolling-mill castings made here, and we have only one small malleable shop.

"In closing I will again appeal to the foundrymen to take advantage of the present times and get their prices up, as we do not know how long pig iron will remain at the present high prices and if it once starts to go down the time will be past and the golden opportunity lost."

The report of the Bethlehem Iron Co. for the 11 months ending April 30, when the company, was succeeded by the Bethlehem Steel Co., shows the following: Total receipts, $4,200,000; total charges, including taxes, interest, depreciation, etc., $3,150,000; net profit, $1,050,000; cash dividends (12½ per cent), $600,000; amount to credit of profit and loss, $3,320,000 The excess of current receipts over current liabilities at the same date was $3,645,681. Estimating on the above basis, the Bethlehem Steel Co.'s earnings for the year would be $1,145,000; the fixed charges, $450,000; leaving a balance applicable to dividends on capital stock of $695,500, or more than 4½ per cent. Unfilled orders on the books May 1 amounting to $6,716,900.

THE PITTSBURG DISTRICT.

David Carlin, William E. Lee, Watson B. Adair, C. C. Henry and R. Solomon have applied for a charter for the North Pittsburg Foundry & Steel Co., and will purchase and operate the Carlin Mfg. Co., of Allegheny. The works will be enlarged and improved. They were partially destroyed by fire some time ago.

The Pittsburg Wire Works of the American Steel & Wire Co., at Braddock, and the plant of the same company at Rankin, closed down Saturday. Repairs and improvements will be made at both plants. The Pittsburg works will resume this week, and the Rankin plant on Monday, July 10.

The Pittsburg Bale Tie Works, of the Griswold Wire Co., at Braddock, Pa., were destroyed by fire July 2. Loss $25,000 to $30,000; partly insured.

The Union Steel Casting Co.'s plant will be completed this week. It has a 15-ton acid open-hearth furnace and two electric cranes.

The Carnegie Steel Co., Ltd., has begun work on its new axle plant at West Homestead. It will cover eight acres.

Walter Kennedy, consulting engineer, of Pittsburg, has received a contract for relining Victoria Furnace, at Goshen Bridge, Va. The contract for the fire brick, about 225,000, has been given to Frank D. Pope, of the Park Building, Pittsburg, representing the Savage Fire Brick Co. Mr. Kennedy also has a contract to equip five furnaces of the Cambria Steel Co., of Johnstown, Pa., with a blast furnace skip of his own design; also to equip one furnace for the Duluth Iron & Steel Co., Duluth, Minn, and four furnaces for Laughlin & Co., Pittsburg.

The Pierce-Crouch Engine Co., of New Brighton, Pa., manufacturers of gas engines, are running their plant full time and have a large number of orders on hand. Among sales of gas engines made by this concern are two 50 h. p. for the Rochester Tumbler Co., Rochester, Pa.; one 50 h. p. for the Freedom Water Co., Freedom, Pa.; one 50 h. p. for Warwood Tool Co., Wheeling, W. Va.; two 20 and one 13 h. p. engine for the Pittsburg & Lake Erie Railroad Co., for pumping plants at McKee's Rocks and Park Station; also one 25 h. p. engine for the Wheeling Mould & Foundry Co. A good many orders have been received for small engines, ranging from 5 to 25 h. p.

The labor trouble at the Homestead Steel Works of the Carnegie Steel Co. has been greatly magnified by the daily press. For some time the company has been discharging men as fast as it was found they belonged to the labor organization, but no men have quit, and operations are not interfered with. It is not regarded possible to seriously interfere with production The company is taking a plain stand in the matter of discharging men affiliated with labor organizations. The law which the men expected to invoke in this connection has lately been declared unconstitutional, and was in any case clearly unjust.

A press dispatch from Monongahela City, Pa., states that a company composed mainly of parties who operated the Duquesne Tube Works has purchased 10 acres of land at Wilson station, and will erect a tube works, to which an open-hearth steel department may be added.

Lake Superior Iron Mines.

The Chicago dispatch of last week saying that the Chapin mine had been leased for 20 years at $4,000,000 to one of the iron and steel consolidations is pronounced without foundation by the owners of the property. The Chapin mine has been a favorite subject of late for surmises as to its contemplated control by leading steel producers.

The Cleveland-Cliffs Iron Co. on July 3 declared a diviend of 2 per cent. Books close July 11. In April a 1 per cent dividend was paid.

A new steam shovel has been put in operation at the Queen mine. It is of extra capaicty and was manufactured by the Bucyrus Co., South Milwaukee.

Alex. Maitland has been made general manager of the Republic Iron & Steel Co.'s mines—the Lillie and Cambria, on the Marquette range and the Franklin on the Mesabi range.

E. A. and J. O. Hayes, representing the stockholders of the Ashland Iron Mining Co., took formal possession of the Ashland mine June 26. The old Ashland Iron Mining Co. no longer exists, but a new one composed of stockholders of the old company will operate the mine.

Owing to its inability to secure workmen, the concentrating works of the Pewabic Co., on the Menominee range, has been closed down.

In a trial recently made at the Cliffs shafts stockpile of the Cleveland-Cliffs Iron Co., Ishpeming, there was loaded 1,025 tons of ore in one hour and 35 minutes.

Arrangements are being made for the re-opening of the Hennepin mine on the Gogebic range. It was last wrought in 1891.

An advance in wages at the Chapin mine went into effect last week.

At Coatesville, Pa., the Lukens Iron & Steel Co. brought suit for an injunction to restrain Edward H. Martin from entering the employ of the Diamond State Steel Co., at Wilmington, Del. Some time ago Mr. Martin was engaged for five years by the Lukens company, as a steel expert and superintendent of the plant, at a salary of $6,000 a year. Recently the president of the Wilmington company, learned that Mr. Martin was to leave Coatsville and go to work for a firm in the west. Negotiations resulted in a contract at a higher salary than that paid at Coatesville. At the hearing the temporary injunction was dissolved. Mr. Martin's defense was that he was interfered with in the operation of the Catesville mill.

The plant of the Premier Steel Co., Indianapolis, Ind., recently bought by W. J. Carlin, of Pittsburg, is to wrecked.

The American Shovel & Stamping Co., capital $100,000, which has been manufacturing at Chicago for some time, has decided to locate at Lorain, O., about 40 per cent of the capital being subscribed by Lorain interests. The company manufactures hand shovels and pressed specialties which enter into the manufacture of agricultural implements. President Du Pont and Treasurer Donaldson, of the Johnson Co., were active in securing the concern for Lorain. Work on the new plant will begin at once.

It is announced that the Phoenix Bridge Co., of Phoenixville, is negotiating for the lease of the old Bellfonte Nail Works, Bellfonte, Pa., which it will rehabilitate and utilize for rolling sheet and angle iron for bridges.

The *Railway Age*, in conection with its statistics of new track-laying in the United States from Jan. 1 to June 30, says that unfavorable weather in the early part of the year put back construction work, yet the total of 1,360 miles is much larger than that reported in the first half of any year since 1892. The *Railway Age* estimates that the total for the year will certainly exceed 4,000 miles, against 3,018 for last year, and may reach 5,000 miles.

Eugene Zimmerman, vice-president of the C. H. & D. Railroad, and associates have bought the Talladega (Ala.) iron furnace, the Birmingham & Atlantic Railway running from Talladega to Pell City, 27 miles, and 3,000 acres of coal and iron lands. The furnace will be in operation in 90 days.

The Means Foundry & Machine Co., Steubenville, O. capital $100,000, has been incorporated to manufacture machinery by A. McC. Flanagan, A. M. Shotter, C. J. Davis, E. C. Jenkins, all of New Cumberland; T. Price, Toronto, O.

The Empire Iron & Steel Co., of New York, turns out to be the lessee of the plant of the old Oxford Iron & Nail Co., Oxford N. J., from the Delaware, Lackawanna & Western Railroad. There are two iron mines connected with the property, which will be worked and part of their output shipped to the Crane furnaces of the company at Catasauqua, Pa. The furnace is to be repaired, two new hot blast stoves are to be built, and it is probable that an additional blowing engine will be put in. The property includes 28 puddling furnaces, three trains of rolls and a nail factory. There are on the property 100 houses, and it includes 2,500 acres of land.

METHODS OF KEEPING FOUNDRY RECORDS.

An interesting and instructive address was delivered at the last meeting of the Pittsburg Foundrymen's Association by Mr. S. H. Stupakoff, who had consented only two or three days before the meeting to take the place of Dr. Kemery, who was to have delivered an address upon a different subject. Mr. Stupakoff's subject was "Foundry Records." He felt that all should have something to say on so vital a subject. The questions a foundry manager or superintendent is always asked regarding the proposed casting are: 1. How much will it cost? 2. How soon can it be obtained? 3 What will be required to make it? The manager can generally tell what he will need, but to arrive at the cost of producing the casting it is necessary to divide cost into these heads: 1. Material. 2. Labor.

To follow up the cost subject properly a man does not need a profound knowledge of book-keeping, but he must have sound judgment. In every foundry there are employed molders, clerks, shippers, etc., and if advisable, these items of labor may be separately dealt with. Likewise, in material, separate accounts may be kept for the different kinds of material, pig iron, coke, gas, sand, facings, etc., and sieves, shovels and other tools. If desired, the iron may be divided into pig iron and scrap, and in turn the pig iron may be subdivided into the different brands and the scrap into the different varieties. Supplies would make another heading, and labor the last heading. If it is possible to record the consumption of materials and labor, taking into account the varying costs of different qualities, then it is possible to predict the cost of future castings when certain data are given.

Recently the manager of a certain foundry said that the foundry was over-producing, this foundry being an adjunct to a large manufacturing business. It was answered by the man who had charge of the records that the foundry had produced in five and a half months so many hundred thousand pounds of castings, the number being between 700,000 and 800,000 pounds. In the period the over-production proved to be but 11,000 pounds, which could have been made in one day. Such a foundry as this is run on entirely different principles from a jobbing foundry, which works on orders entirely. It has the advantage of being able to fill up at times with castings which may be expected with certainty to be called for in the next two or three months, but even in such a case there must be no guess work, and here is a place where foundry records are absolutely essential, because from these records can be learned how many pounds of a given class of castings are customarily used in a given time, how many are in stock, etc.

To supply the information required in this connection, the storekeeper was required to get up a book for castings in his charge. To show the magnitude of the work, it should be stated that the storekeeper has to have not less than 3,500 different headings and subheadings, this being the number of different castings which were expected to be in stock. The first column under each heading starts out with the stock on January 1, followed by the castings made from time to time. The next column gives the withdrawals made from time to time, and these entries, by the necessary subtraction and addition, give the results for the third column, which shows the number or weight of castings on hand at any time. The storekeeper sees also in the second column the number which is likely to be called for at any time, and by using his judgment can determine the maximum and minimum number of castings which should be kept in stock. In order to keep these records properly it is necessary to have all the castings go through the store-room, and to check the records it is neces sary to have evidence from the producer and from the receiver. So there is a daily foundry report sheet, giving the production, and this is verified by the storekeeper from his figures of the castings received, while the evidence from the other end comes in the shape of requisitions, coming from those who receive the castings, these requisitions being kept by the storekeeper and furnishing a check on his figures of withdrawals. These foundry report sheets and the requisitions are systematically filed by the storekeeper. The foundry foreman keeps the records of production, entering on the slips the weight and number of castings. For each workman there is a printed slip, one style for day workmen and another for piece workmen. In this foundry as much work as possible is put out on the piece system, and the rule is in force not to pay for bad castings. The practice was started half a dozen years or so ago, and having no trouble with it, it was made a part of the contract. On these slips are spaces for the date, employe's number, etc., and columns for the order number, date, number of hours, number of pieces, description of article, and price, each piece occupying one line and all the data regarding it being thus given.

This is all detail so far, without any determination of the cost. The slips must all be turned in to the time-keeper, or the men will not be paid, and the time-keeper then finds from the data furnished the time worked. If castings prove bad in the foundry they are so entered at once, but if they prove bad afterward, in the machine shop, when the slips have been turned in to the time-keeper, then the word is passed to him, and he makes the proper entry. In this way the exact amount of time required is ascertained, because all the time put in is accounted for, and bad castings are all charged up, so that the time is not made to appear less than it really is on an average.

For the manager's own use there is a large sheet, on which are entered all the results. There is a separate sheet for each month. It contains a large number of columns, showing all the materials used, the labor, with its cost, the number of castings made and the weight, the weight withdrawn, the cost per 100 pounds of castings, and the average weight of the castings. From the data as entered on this monthly sheet, it is possible to determine the cost of castings. The average weight of casting in the foundry in question is five pounds.

At the close of the address, of which the above is a summary, President Yagle said the meeting would be glad to hear from Mr. Sleeth, who stated that in the works with which he is connected they follow a somewhat similar system. They cast from 5,000,000 to 6,000,000 pounds a month, making from 30,000 to 40,000 pieces a day. They have a daily record which is entered into a monthly sheet. They charge the purchases of iron during the month and take account of the stock at the beginning of each month, by which means the consumption of iron is obtained. Their rule is to count the work and not the molds, the result being so many good castings and so many bad ones. Mr. Sleeth related an anecdote of his experience when a boy. He was in a foundry where the foreman counted the number of molds, with the result that the molders imposed on him a great deal by just making a hole in the sand and having it poured, thus getting credit for a casting which went right into scrap. The system of the speaker's company is to consider pig iron the only real material, as it is the only thing going into the finished casting; everything else is lost, including labor.

Mr. Taylor called attention to the fact that the methods applicable to foundries where there was a regular run of work were of no use in a jobbing foundry, and complained that they were continually losing. He mentioned the case of a 400-pound casting on which a price of $10 was fixed in advance. It had been figured that the molder would take half a day, but the result was a cost for the casting of $11.25, when the selling price was only $10.

Mr. Stupakoff said there certainly were some kind of records kept in jobbing foundries. By taking into account the cost of the pig iron, etc., and then at the end of the year comparing the receipts, it would be possible to sum up all the extras and find out what must be added to the figured cost of a casting to make it come out right in the general summary.

Mr. Taylor said they did keep records, but he did not like to say how. He had the figures for the case he had brought up, as follows: Iron, $3.25 (allowing 25 cents for melting); moulding, $2.75; core-making and material, $2.50; lumber and carpenter work, $1.25; chipping, $1; delivering, 50 cents, making a total of $11.25. He did not like to give away figures, but here they were.

WITHIN a short time the plant of the Brown & Sharpe Mfg. Co., Providence, R. I., will be increased by the addition of a foundry and a large four-story brick building, to be used as a machine shop. Ground has already been broken for the foundry and the foundation for the other building will be laid this fall.

METHODS FOR THE IRON LABORATORY—IV.

BY FRANK L. CROBAUGH, CLEVELAND.

Sulphur.

The only available method for use at steel works and blast furnaces, where very speedy results are demanded, is based on the fact that all, or a part of sulphur of such metal, is evolved as hydrogen sulphide when dissolved in hydrochloric acid. In some metal it is impossible to obtain the full sulphur content by this method. Some claim this is due to the formation of organic sulphides, probably of the mercaptan series, others to copper and arsenic whose sulphides are precipitated in acid solutions, still others claim that titanium holds back the sulphur as sulphide, while I prefer to use cold hydrochloric acid, sp. gr. 1.10 for the evolution. Others claim that it takes acid of 1.20 sp. gr. to evolve the sulphur completely. Williams finds that hot acid evolves more sulphur than cold acid. (See proceedings of Engineers' Society of Western Pennsylvania, vol. 8, page 328.)

The hydrogen sulphide evolved may ,when taken up in any of several absorbents, be again liberated by hydrochloric acid and titrated with a standard solution of iodine. Caustic soda is often recommended. One c. c. of a 10 per cent solution of this base will absorb .057 per cent sulphur, when operating upon five grammes of metal, which weight is the basis of data in this paper. Any absorbent used must be tried for the amount of iodine solution it will consume. I prefer to use cadmium chloride as an absorbent, for investigation upon which see a paper by the writer, (*Journal of Analytical and Applied Chemistry*, vol. 7, No. 5, May, 1893). The yellow sulphide formed (always in containers of the same size) may tell the chemist about what percentage of sulphur is present. 1 c. c. of a cadmium chloride solution, 20 grammes per litre, will absorb .069 per cent sulphur. Cadmium chloride solution is best made by dissolving 20 grammes of the salt in 500 c. c. of water and adding 500 c. c. of strong ammonia. I prefer an iodine solution of such strength that 1 c. c. will equal .005 per cent sulphur. Theoretically a solution of iodine, two grammes per litre, will give the above value, and some chemists re-sublime the purest obtainable iodine and take two grammes per litre, calling the value .005 per cent per c. c. Others prefer to call the value .005 plus or minus, to account for the sulphur not evolved from the particular kind of metal upon which they are working, or because, according to certain standards in their possession, it seems higher or lower. Still others prefer to standardize the iodine solution upon drillings, the evolved sulphur of which has been carefully and repeatedly determined by gravimetric methods. Such a course of procedure has much to commend it for commercial work. This has been my habit for many years. Others prefer to get the value by direct titration of theoretical chrystals of sodium hypo sulphite, while yet others prefer to standardize it by aid of a standard solution of potassium bi-chromate. This course of proceedure is long and involves comparatively much time and manipulation. The above methods check very well with one another when carefully conducted. For a complete understanding of the methods I recommend a careful study of all references herein mentioned.

I am enabled to bring this volumetric method into the "family" of methods so far as standardizing the iodine solution is concerned. For this ability I am indebted to Mr. H. L. Payne, who published a valuable paper in the *Journal of Analytical and Applied Chemistry*, (vol. 6, No. 9, September, 1892) and who published some corrections of the same in the Journal of the American Chemical Society, vol. 16, No. 2, February, 1894. I have recently taken up his paper and am able to suggest some additional details, based upon experiment. The theoretical values obtained by his process are in accordance with the best Gravimetric results on iron and steel. The preparation of starch solution is described in "Common References." While it is not a usual practice, I prefer to add the same amount of starch solution (3 c. c) to each determination. The solution should always be agitated to render it homogeneous before drawing off a portion of it for the determination. After a starch solution has stood the supernatant liquid will give quite a different tinge in end reaction, from the thicker deposit on the bottom. Some prefer to use the supernatant liquid only. I like better the end re-action due to the homogeneous mass.

According to Mr. Payne's paper, the sulphur equivalent of any standard permanganate solution is 2-7 of its iron value (see re-actions which he furnishes)—that is, any permanganate solution will liberate iodine from potassium iodine equivalent to 2 7 of the iron value of the permanganate solution, but since the iron value $=\frac{1}{5R}$ the sulphur equivalent will $=\frac{2}{7}$ times $\frac{1}{5R}=\frac{2}{35R}$. [Value of R, as in paper No. 2]. I prefer an iodine solution one c. c. of which shall equal .005 per cent sulphur. This is equivalent to an iodine solution one litre of which will re-act to completion with the .25 grammes of sulphur.

To obtain the number of cubic centimeters of standard permanganate solution which it is necessary to add, according to his method, to potassium iodine, divide .25 grammes by $\frac{7}{35R}$. This simplified means that the number of cubic centimeters of any standard permanganate solution, which must be added to potassium iodine to produce one litre of an iodine solution having a sulphur value of one cubic centimeter=.005 per cent sulphur, on five grammes of metal =4 375 x R.

To prepare one litre of a standard iodine solution, dissolve six grammes of potassium iodine in 150 c. c of water, transfer the solution to a litre flask, add the amount of permanganate solution deduced from the formula, then add 20 c. c. of a cold mixture, 1 volume sulphuric acid sp. gr. 1.84+3 vol. of water; agitate the mixture. When the oxides of manganese are dissolved, dilute to the mark and again agitate. Each cubic centimeter of this solution equals .005 per cent sulphur when five grammes of sample are operated upon. A calculation will show that sufficient potassium iodine of the six grammes is left unchanged to hold in the solution the iodine liberated (see "Blair"). The data to follow seem to prove that the value of this iodine solution is correct and that the solution is perhaps less subject to change than iodine solutions prepared in the ordinary way. The time required to make such a standard solution will not exceed two minutes. In March and April, 1899, I made three solutions by the above formula, finding them identical from 30 minutes to 20 days after they were prepared, using the same drillings for comparison. My experiments have been about 30 in number, and were based upon careful gravimetric estimation of evolved sulphur.

In the American Foundrymen's Association standards [see note concerning them under manganese determinations, in paper No. 3], I obtained results very close to those furnished with the standards. In their sample "B" I find .038 per cent sulphur against their .038 per cent. In their sample "D" I find .025 against their .024 per cent sulphur. In a standard prepared by Booth, Garrett & Blair in February, 1892, I make the evolved sulphur .051 per cent; they reported it .052. My experiments with these solutions have covered a wider ground. Further figures here seem unnecessary. I have discovered that as much as one-third of the sulphur capable of being evolved is often held back owing to the decomposition of hydrogen sulphide, if the evolution be conducted in bright sunlight

The operation is conveniently conducted in a 16-ounce flask provided with a rubber stopper carrying a one bulb thistle tube and a glass tube 5-16 of an inch in diameter, bent after leaving the stopper at right angles with the neck of the flask and extending therefrom about 6½ inches. (The thistle tube should be of such length that when the stopper is fitted, it should be about ¼-inch from the bottom of the flask. The glass tube should extend just through the stopper.) To the outer end of the glass tube is applied a rubber connection 4½ inches long. The other end of the rubber tube connects with a straight glass tube 6 inches long, which dips to the bottom of a common glass 5 inches in altitude, with top and bottom diameter 3 inches and 2 inches respectively. When using the apparatus connection is always made and broken at the upper end of the straight glass tube (it may be used ater as a stirring rod). To use the apparatus, add to the glass 10 c. c. cadmium chloride solution, 125 c. c. water and 3 c. c. starch solution. Place five grammes of drillings in the flask, insert the stopper and make connection with the straight tube leading to the bottom of the absorbent. Add through the thistle tube 70 c. c. cold hydrochloric acid sp. gr. 1.10.

When the evolution of gas becomes slow place the lowest possible Bunsen flame beneath the flask, increase the heat

cautiously to complete solution of the drillings. This will usually require about 20 minutes. When the line of demarkation between the boiling froth and the darker liquid below is sharp, the drillings are usually dissolved. Just before disconnecting increase the heat for a few seconds to expel the last traces of hydrogen sulphide from the flask. Immediately add to the absobent an equal volume of cold water. Then, with stirring, add hydrochloric acid, sp. gr. 1.10 from a wash bottle until all traces of the yellow sulphide are dissolved. Titrate at once from a previously filled burette to a distinct blue end reaction. Duplicate results agree nicely.

On a sulphur determination the difference of .003 per cent between two chemists would be admissable. There are certain irons, notably those mentioned later under silicon determinations as with difficulty soluble, to which this method cannot be well applied. Irons with high combined carbon dissolve more readily than others. At some blast furnaces it s the custom to correctly estimate the evolved sulphur, adding to its percentage such an amount as is usually found in the residue of the particular class of iron produced.

Calcium.

The estimation of this element is frequently demanded in limestone, slag and iron ores. The percentage of the metal found is ordinarily reported as calcium oxide (lime) or as calcium carbonate. From data available to me I infer that the method depending upon the titration of oxalic acid is more accurate than any other method. It is certainly more rapid. Dec. 29. 1892, I made some comparative experiments. By titration I obtained 55.24 per cent lime in so-called chemically pure calcium carbonate. By weighing the precipitated oxalate of lime I obtained 55.21 per cent. Later experiments have been equally satisfactory. I prefer the volumetric method as follows:

Prepare (as per "Common References") a suitable weight of material for the precipitation of its calcium, transfer the solution to a graduated flask 500 c. c. capacity heat to boiling, add from a burette exactly 70 c. c. of a solution of ammonium oxalate (25 grammes per litre), boil for five minutes, cool to ordinary temperature, add water to the mark, agitate and allow to settle. When the supernatant liquid is sufficiently clear, remove an aloquot portion from the flask. Dilute it to 200 c. c. with water, add 10 c. c. of sulphuric acid sp. gr. 1.84, which will aid in bringing the solution to a temperature of 60 degrees centigrade, at which temperature it must be titrated with a standard solution of potassium permanganate. If the temperature exceeds 60 degrees low results may be expected. If it be below this temperature the reaction begins with difficulty. The end reaction is a faint, permanent pink. The ammonium oxalate must be protected as a standard solution. Before using it dilute 10 c. c. with water, add 10 c. c. of sulphuric acid sp. gr. 1.84 and titrate with the standard solution of potassium permanganate. In the determination is titrated the ammonium oxalate not consumed by the calcium. Having ascertained the amount of potassium permanganate solution which the ammonium oxalate used will consume, and also the amount of permanganate solution which the excess of ammonium oxalate will consume, their difference represents the amount of oxalic acid combined with the calcium. The following equations yield the lime and calcium carbonate values of any permanganate solution.

Let CaO=the calcium oxide value.

Let $CaCO_3$=the calcium carbonate value.

Then $CaO=\frac{1}{10R}$,

and $CaCO_3=\frac{.17857142s}{R}$

The quantity of ammonium oxalate above described is sufficient when working upon limestone. When operating upon materials richer in lime more must be added or the quantity must be very much diminished when working on iron ores.

In the event extreme rapidity is demanded, dilutions in the flask may be made with hot water, in which the precipitate will subside with great rapidity, or it may be allowed to subside only partially, when sufficient solution to obtain an aloquot portion may be passed through a dry filter into a dry beaker. If these operations are conducted with rapidity the change due to the diminishing temperature will be insignificant.

AMERICAN, ENGLISH AND GERMAN PRACTICE IN MACHINE TOOLS.*

BY ARTHUR GREENWOOD.

In introducing this subject for discussion, the wirter proposes to divide machine tools into four classes, namely:

1. Planing machines, with which may be grouped shaping, slotting and machines used for cutting straight surfaces of metals with knife-edged tools by reciprocating motion.
2. Lathes and boring machines, for cutting circular surfaces of metals with similar knife-edged tools.
3. Milling machines, for cutting straight or curvilinear surfaces of metals with circular rotary saw-like cutters.
4. Automatic machine tools, for special purposes.

It is upon the planing machines that the engineer relies as a basis in mechanical construction, the first requirement being a true flat surface; secondly, speed in obtaining that result; and, thirdly, economy in wear and tear and facility for maintenance in an efficient state. Strength and rigidity are the main factors in obtaining these results. These being assumed, there has to be considered what is the best form of bed surface, the best section of cross-side, and the best driving-gear. In the earliest planers, acute V surfaces were used, doubtless to resist the strain of side-cuts, and to take up the wear automatically. These V's, of from 60 degrees to 90 degrees, have been gradually flattened, with beneficial results as regards scoring, until 140 degrees is a common practice; but all V's are difficult to make a good job in the first instance, and still more difficult to correct when by wear they become hollow or assume a "wind." The latest practice is to use flat surfaces with square or angular lips, and taking up slips to take the side strains. They much more easily effect a thoroughly good job in the first instance, as bed and table can be scraped to surface-plate independently, and are much more readily tested and readjusted when in use. The flat bed is gradually being adopted in England, and, to a less extent, in America and on the Continent, but even here the prejudice in favor of V beds dies hard. In some dozen large planers just completed or under construction by the writter's firm, V's have been specified by the purchasers in most cases, sometimes with a central flat surface; only in two or three cases have the makers been allowed to carry out their recommendation of flat surfaces alone.

The laetst practice in cross-sides is the square lip on the upper side, certainly in America, and to some extent in this country, particularly for heavy machines. Much has been attempted in the past to make planers duplex in their action, either by reversing the tool or arranging the machines with two sets of uprights and cross-slides so as to cut in both directions; either method obviously can only be used with advantage in plain surface work, and both systems are seen more in England than in America or Germany. To economize time in running back, the Americans are leading the way by using very quick return of table up to and even beyond four times the cutting speed. This entails very perfect gearing and accurate reversing gear, friction clutches being often used; it absorbs, at any rate momentarily, a large amount of power, as those using electric driving can readily see by watching the ammeter.

For driving gear in this country, the screw is much in favor; it works smoothly and simplifies the gearing, but is not quite so economical in power as well-adjusted rack gearing. The Americans generally prefer rack gearing, and are obtaining splendid results with engine-cut fine-pinched gear. The compromise between the screw and the rack originated by Sellers in the States is largely used there, and has been followd by some English and German makers. Unless the gearing is veryaccurately pitched, there is a material increase in the power used. The most economical planer for general work would appear to be the single-acting machine, with a very high speed of return, and a most accurate reversing gear easily adjusted whilst the machine is running, so as to reduce the idle time of the machine to a minimum.

Lathes.—In England the upright V, generally in conjunction with a flat, was originally used for lathe beds. Now, however, flat-surfaced beds with angular edges, or, as they are sometimes called, "gib" beds, are almost invariably used, being

* A paper read at the bi-ennial conference of the Institution of Civil Engineers, London, June 7-9.

generally considered more robust and more readily kept in repair. The Americans, however, with one or two notable exceptions, adhere to the upright V, generally double, and this constitutes the leading difference between Eastern and Western lathes. The saddle mounted on the V's moves with less friction, but for heavy cuts this advantage is lost, as the saddle must be weighted or retained by a lip to prevent the cutting tool running in. As regards headstock and spindle, the prallel neck is more used in the States than in this country, where conical necks are generally used for small lathes, and parallel ones for the heavier ones. Cones and belts for traverse gear are now being generally discarded in favor of direct gearing both in England and the States, and the lathe headstocks of the future, with a variable speeded electric motor combined, will soon see the end of belt-driving, at any rate so far as lathes are concerned. In lathes generally the Germans follow more closely the English than the American type.

Before leaving lathes, one must remark the very general adoption, particularly in America, of the horizontal face-lathe, or boring mill, which offers facilities both for speed and accuracy. Turret lathes may be grouped with automatic machinery.

Milling.—This is one of the earliest known ways of cutting metal, doubtless temporarily eclipsed by the development of planers and tools under Class 1. Both in America and in this country, manufacturers of aritcles where great repetition occurs, such as rifles, sewing and some textile machinery, have used milling for the past 40 or 50 years, and the development of this sytem of cutting metal, as seen in the modern universal miller in a well-equipped tool-room, leaves little to be desired for rapidity, accuracy and general adaptability. During the past 15 years milling machines have been largely introduced for heavy work, notably for locomotive and engine builders, and in this direction English makers have certainly been to the fore. Some of the Continental makers have carried milling to questionable lengths, particularly in France, where one has seen work being milled which might have been more advantageously done on planing machines. In England and America and in France, vertical millers are principally used for plain curvilinear work. Many are also made on the planing machine type with either horizontal or vertical spindles, or both. This is an excellent type of machine, particularly for straight work. The Germans often go to the length of combining this type of machine with a planer, but as a rule combination machines are to be avoided.

Automatic machinery for special purposes is now coming very much to the front, chiefly in America, but both this country and Germany are moving in the same direction. Where great repetition of parts is required, there can be no doubt of its advantage. A general type of machine is a hollow spindle lathe with automatic feed and chuck for the material to be operated upon, a saddle with turret rest, back and front transverse slides, all driven automatically from a cam shaft. This machine will produce studs, screws, bolts and other analogous work from the solid metal bar. By using special chucks, wheels, pulleys, cylinder-covers, and other parts of engines or machinery may be finished at one fixing, as against innumerable chuckings in the ordinary boring and turning lathes. The advantages claimed for this system are that a comparatively unskilled operator may attend to a number of machines, the tools and tool-adjustment being controlled by a skilled mechanic. The enormous advantage of this sytem of manufacture must not be sacrificed by attempting to do too much, and discrimination is required to see that work which can be better done by separate operations is not attempted on this class of tool. In turning work from the bar, such as studs, bolts, etc., care must be taken that the advantages gained by saving of labor is not lost by waste of material, and articles having large differences in diameter may often be advantageously forged and finished in other types of automatic or other lathes. Now that the gearing of nearly all machine tools is engine cut, automatic gear-cutters are largely used. Oneattendant serves quite a number of machines.

In machine tools generally, with some recent exceptions, the Germans have followed pretty closely the English lines, but have produced cheaper and lighter tools, and have lacked in originality. The Americans, on the other hand, have struck out on lines of their own, based on those of some of the earlier English makers. They are generally well-made, convenient to manipulate, but of lighter construction, and have not the endurance of English tools. The English tool makers for a long time were practically the makers for the world. For strength, stability and down-right wearing capacity, they still hold the first place; the one reproach that may be made against them is their comparative slowness in producing tools required to meet the growing and changing requirements of the trade, which gives the Americans a certain pre-eminence. Probably one of the reasons is that here tool-makers attempt too many varieties. Nearly every maker produces all the various classes, whilst in America they generally confine themselves to one. Whether this is arrived at by mutual arrangement, or is the result of their practical nature, the result is satisfactory in producing machine tools of standard sizes suited to the requirements of the hour, and, by reason of this standardization, at an economical cost.

Germany' Iron-Making Resources.

Some interesting details have lately been published as to the character and extent of the resources for the production of iron and steel in Germany. It appears that at a recent date there were 672 iron mines in the Empire, of which 486 were exclusively devoted to iron mining, while 32 others mined iron ores as an accessory product. At the same date there were 154 mines not in operation, of which 96 were in process of being opened out. Of the 101 works which produce pig iron, 58 produce that metal alone, while 51 others produce also finished iron or steel. There were in operation 1,208 foundries, of which 356 produce only castings, 107 are part of general metallurgical works, and 745 are connected with engineering or other establishments. There were 186 forges in operation—that is, works which did not produce cast metals—of which 56 were exclusively engaged in producing iron or steel by forging, 122 were connected with establishments that manufactured other forms of metal, and eight were attached to works that were not otherwise metallurgical. Of steel works, the total number in existence throughout the Empire was 163, of which 39 manufacture only steel, 111 manufacture other metallurgical products, and 14 form part of non-metallurgical works.—[London Iron and Coal Trades Review.

Wm. H. Wood, engineer and builder of special machinery, Media, Pa., reports that he has completed the erection of two hydraulic riveting plants and an air compressing plant in Honolulu, Hawaiian Islands. He is erecting a complete hydraulic riveting plant for the Waterous Engine Co., Brantford, Can., and has shipped a complete hydraulic riveting plant to Thos. C. Basshor & Co., of Baltimore, Md., and has orders to ship a hydraulic riveting plant to Edw. Keeeler Co., Williamsport, Pa., also a 10-ton hand crane traveling crane. Recent shipments include an 800-pound single standard steam hammer to the Shiffler Bridge Co., of Pittsburg; a 10-inch x 6 foot accumulator to Buffalo; and one 1,500-pound single standard steam hammer to the Carter Oil Co., of Titusville, Pa.; one air compressing plant to Cleveland; one 800-pound, one 1,100-pound and one 1,500-pound single standard steam hammer for DeFries & Co., of Dusseldorf, Germany. One 18-inch x 3¼-inch x 18-inch hydraulic duplex pressure pump and one 10-inch x 15 foot accumulator and reverberatory rivet heating furnace, were supplied to the U. S. Government, Boston Navy Yard, Boston, Mass. A number of the automatic safety valves and pressure reducing valves as applied to accumulators went with the above. A recent order for two 1,500-pound single standard steam hammers came from the New York Shipbuilding Co., of Philadelphia.

The Hawley Down Draft Furnace Co., Minneapolis, Minn., has filed articles of incorporation, being promoted by Charles E. Blyer, of Chicago, and by M. B. Koon, Joseph Chapman, Jr., F. B. Semple and Horace Hill, of Minneapolis. The capital is fixed at $100,000, and the object of the company is the manufacture of furnaces, boilers, engines, heaters, water purifirs, etc. A plant is to be built.

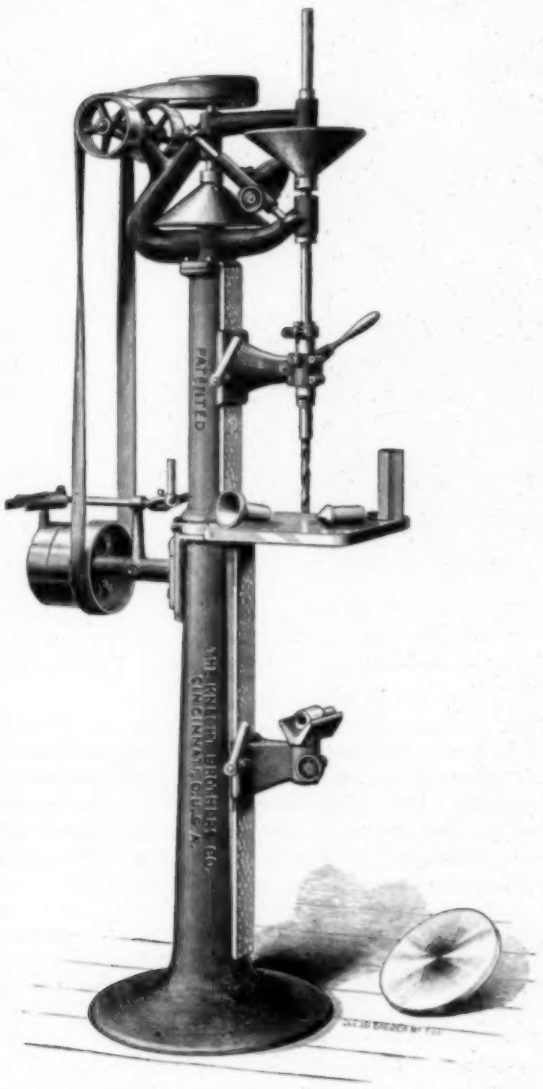
The Standard Heating & Boiler Co., Nashville, Tenn., wants second hand machine lathe for general work, back screw cutting 36-inch swing and about 11-foot centers; also second hand planer, with 5-foot table, complete with tools.

FRICTION SENSITIVE DRILL.

The Knecht Bros. Co., of Cincinnati, manufacturers of special machinery and tools, are builders of the friction sensitive drill press shown in the illustration below. It is adaptable to a variety of work, drilling rapidly and accurately, and is one of the essentials of tool-room, model shop, instrument making and inventive work.

The driving mechanism consists of two cones, between which is held the friction roller. Power is transmitted from the lower cone to the friction roller which transfers it to the upper or spindle cone. The roller is adjusted radially with the cones. The speed of the drill spindle is increased or diminished instantly without stopping the machine or shifting the belts and without change of the operator's position. By sliding the friction roller frame, upon which is mounted the friction roller, from one extreme to the other, a distance of only 4½ inches, any number of speeds can be obtained for any sized drill from the smallest up to and including 9-16.

More or less driving power to the drill spindle is applied, as the size of the drill or the nature of the work may require, as in using very small drills, should the twist drill come in contact with the hard substance, if the operator is not very careful, it is apt to break off. In this machine the tension of the friction roller or transmitter between the two cones can be adjusted closely and promptly, by turning a hand adjusting nut under the lower driving cone, making enough tension



to pull the twist drill used in the machine. Should the twist drill bind or be heavily strained, by imperfections in the material worked, the drill will not break, but the friction roller will be made to slip, stopping the drills instantly. Any degree of power can be applied to the drill spindle, as the nature of the work requires.

The cone that drives the spindle is mounted on a sleeve which extends through both bearings in the frame, the spindle being relieved thereby from any lateral pressure. Thus the machine when properly oiled will run any length of time without heating. This spindle sleeve has ball thrust bearings. On the bar on which the friction roller frame slides are marked the sizes of drills within range of the machine, so that the operator can get the proper speed for any drill, by placing the end of the roller frame at figures on the bar corresponding to the size of the drill to be used in holding it in position by a clamping screw. An improved stop collar is used on the spindle sleeve, which may be removed when not in use by removing the binding screw. This collar can be adjusted and set to drill any number of holes a fixed depth without referring to the graduation on the sleeve. The machine is driven by an endless belt, and when the belt becomes loose slack can be taken out by drawing down the counter shaft. For this a small adjusting screw is fitted in the slot in the back of the column.

Review of the Technical Press.

BY DR. E. MOLDENKE.

Theory and Practice in the Foundry. [*Journal of the Berlin Society for Industrial Advancement, Apr. 10*]—In an interesting lecture before this society Capt. Henning reviews the recent advances made in what might be called "scientific founding." It is especially gratifying to note that the disinterested work of our American foundrymen has been duly appreciated by their European brethren, and that an era of study and unprejudiced practice thus inaugurated in the foundry world is bidding fair to restore much of the lost ground chargeable to our imperfect knowledge of the materials we deal with. After referring to present tendencies in the arts, especially the ones dealing with iron and steel, Capt. Henning shows that in order to satisfy the demands made upon modern structural material, the old methods of trying to fill the bill would no longer do, and exact and advanced methods are required. Here chemistry will do wonders for us in providing a satisfactory and absolute reliable starting point in our works, whatever we may do with it later. Given a proper mixture to charge into the cupola, barring accident or carelessness, the results will come out right.

In this study of the real nature of cast iron as a basis for further improvement the work of all our investigators when thoroughly digested and put together forms a very valuable contribution to foundry science and practice. Thus the effect of the impurities in iron are noted: the melting temperatures, the composition of the fuel, molding sand, and the various classes of iron discussed. The importance of buying by analysis is thoroughly ventilated, which shows that foundrymen in Europe are arriving at the same conclusions in this regard as we are. It may be interesting to compare the average composition f fooundry irons used in Europe with ours:

	American.	Luxemburg.	English.
Total carbon,	3.5 —4.0	3.3 —3.7	3.0 —4.0
Graphite,	3.0 —3.3	2.6 —3.5	2.6 —3.5
Silicon,	2.4 —3.2	1.8 —2.5	1.7 —3.4
Manganese,	0.3 —1.2	0.4 —0.9	0.5 —1.8
Phosphorus,	0.3 — .8	0.5 —0.8	0.4 —1.4
Sulphur,	0.02—0.05	0.02—0.05	0.01—0.10

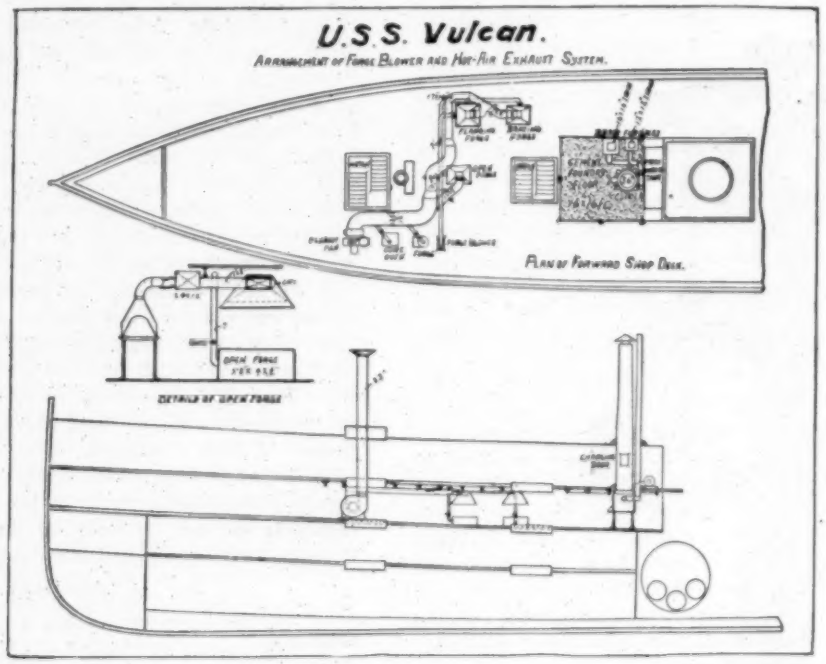
The lecture concludes with series of tables of physical tests on German test bars, which show that in spite of our advantages in quality of fuel and iron, very creditable results are obtained on the other side. In the discussion which followed attention was called to the lack of homogeneity in the iron tapped where the pieces of scrap are heavy or where an iron high in phosphorus is mixed with another quite low in this impurity. Moreover, instances were cited where white irons in a mixture which melted first gave hard castings, though soft ones were expected and came later on. This goes to show the danger attending the mixing of extremes in composition in the cupola. In closing the discussion Mr. Kirchner, editor of the *Eisenzeitung*, described the methods pursued in the American Foundrymen's Association series of tests for obtaining the great number of bars at practically the same casting temperature.

THE National Steel Co. has options on two-thirds of the property needed for the erection of additions to its steel plant at Sharon, Pa., and for other extensions. About 10 acres of ground is included.

THE FORGE SHOP OF THE VULCAN.

One of the novel features of the Spanish-American war was the repair ship Vulcan, of which Chief Engineer Sims, and P. A. Engineer Aldrich have told an interesting story in the June issue of the *Engineering Magazine*, from which we quote. A general description of the Vulcan's equipment was given in *The Iron Trade Review*, of August 25, 1898. Engineer-in-Chief Mellville, U. S. N., had brought to the attention of the secretary of the navy "the desirability of making such preparation for the fitting out of a vessel which would be a floating repair shop, as would enable the work to be done with great rapidity when needed." Scarcely had war been declared when active preparations were made to carry out this recommendation. The steamship Chatham of the Merchants' & Miners' Transportation Co., was purchased by the government, sent to the Boston Navy yard, overhauled, fitted out, renamed Vulcan, placed in commission May 22, sailed for Cuba June 22, reported to AdmiralSampson off Santiago, July 1, and was ordered to the naval base, Guantanamo Bay, 36 miles to the eastward. Here the Vulcan came to anchor, in the afternoon of the same day, and entered at once upon her long career as a repair ship for the fleet.

"Fitted out with the most approved workshop appliances, with a large and varied assortment of engineer's and ship's stores, and picked complement of skilled mechanics, the Vulcan was pre-eminently an 'engineer's ship.' The



project was in no sense an experiment. Had it been looked upon as such, it passed beyond the experiment stage in less than 24 hours after reporting for duty to Admiral Sampson. From the stand-point of equipment, the key to the Vulcan's success as a floating repair shop is to be seen in the selection and arrangement of machinery of the shop deck. No method of arranging shops on shore would apply at sea. No convenient wings, ells, or tees could be run off from a central shop system. No gallery plan could be adopted. The fore-and-aft arrangement of everything was necessitated by the rigid requirements of having all work on deck, as near the discharge of work, with convenience of supervision, giving water's edge as possible, facilitating receipt, execution and ready command of the whole work of the shops.

"The installation of the forge blower, and hot-air exhaust system is shown in the illustration. The former was a Monogram Sturtevant blower, with 7-inch discharge driven from the forward line of shafting, and the latter was equipped with a standard Sturtevant exhaust fan, with 23-inch discharge, and driven by a 3 by 4½-inch engine. The New England mechanics, working nine hours a day, 'tween decks, off the south coast of Cuba, in mid-summer, required all the fresh water and air they could get. The next best thing to the forced circulation of fresh air was to have all the foul air and smoke from the forge fires exhausted, and this arrangement proved of inestimable value."

This type of installation, whereby the smoke is positively removed from the forges, has already been applied on land by the B. F. Sturtevant Co Its success under these conditions led to its adoption on board the Vulcan.

Wire Wound Fly-Wheels.

In view of the attention that has, of late, been devoted to accidents from the bursting of fly-wheels, and the various designs that have been proposed to prevent them, it seems a bit strange that only passing notice should have been given to wire wound rims for such wheels. Several wheels of this character have been turned out and have been at work with good results for a sufficiently long time to take them beyond the purely experimental stage, but still they have remained isolated examples of a possibly excellent type. Cost of construction may have something to do with this, for their cost was, in all likelihood, comparatively high. But if they thoroughly accomplish the attainment of safety, as they seem to have done, they represent an investment quite as profitable as any that might be made with the saving in cost of a wheel of ordinary construction and the usual uncertainties of behavior. What a fly-wheel rupture is capable of doing in the wrecking of its surroundings has been shown by a long list of costly accidents. The wire-wound fly-wheels that have been used thus far have been of the home-made variety; that is to say, they have been made by their users, and none, so far as is known, have been offered for general service, so that possibly one additional reason why there are so few of them may be lack of advertising and lack of information, to any appreciable extent, of their good points.—[Cassier's Magazine for July.

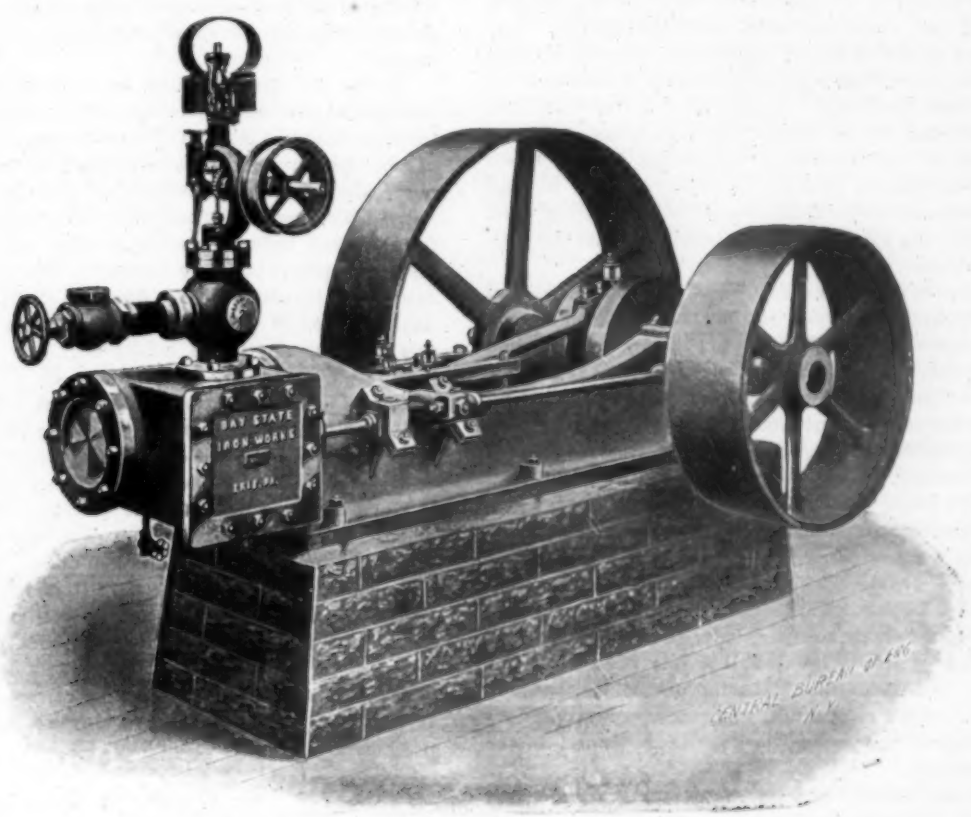
An interesting exhibit has been made, the past week, in a Cleveland store window, of steel balls from 1-16-inch to 4 inches in diameter. It attracted the attention of large numbers of people, in view of the fact that steel balls are rapidly coming into use, and are being applied for various uses. The exhibit was made by the Grant Ball Co., 66-72 Clarkwood avenue, Cleveland, who are making a specialty of large-sized balls. Metals other than steel are now being used also in the production of balls, including aluminum, phosphor bronze German silver, bell metal and brass. Balls are now being successfully applied for bearings in wind mills, coffee grinders, gun carriages, water pipes, gasometers, motor cycles, automobiles, etc.

The Stirling Co.'s plant at Barberton, O., is crowded with work. The foundry capaciy is to be doubled by the erection of a brick building 60x100 feet. The tube bending and the marine deparmtents of the boiler shop are to be enlarged.

CENTER CRANK ENGINE.

The class B center crank engine of the Bay State Iron Works, Erie, Pa., is of the overhung cylinder type, which allows for expansion and contraction without resultant strains in cylinder or bed. The metal in the bed is distributed so as to insure strength and rigidity with medium weight. The cylinders are fitted with hot air jackets to reduce condensation. Slides and cross-heads are of extra length and width and give large wearing surfaces. Crossheads and crank pin boxes are bronze, provided with means of adjustment at both ends of the connecting rod. The eccentric rod connections are heavy bronze stub ends fitted with set screws and jamb nuts for adjustment, and eccentric straps are lined with extra babbit. The connecting rods and straps are forged from refined iron, and the crank shafts are made from solid forgings.

The port areas are large enough to allow of a piston speed of 600 feet per minute. A special field of these engines is in small electric light plants. They are manufactured in nine sizes, ranging from 7 to 60 h. p., cylinders ranging from 5x9 inches to 12x16 inches.



Depreciation in Machinery.

In fixing the amount set aside for depreciation, we are at once met with a bone of contention. Shall the fixed amount be deducted yearly from the original or depreciated value? In other words, shall the life of the machine be taken as the period during which its cost shall be provided for, or shall there be at the expiration of that time a residual value which is equivalent to an extended life? It is quite certain that every machine which is replaced has some residual value. The material of which it is composed is worth something, and to that extent the absolute wiping out of its value in a given period is unjust. Generally speaking, however, the amount is not large and may, in any case, be allowed for in making the calculation of the yearly allowance.

It may be fairly argued that the plan of deducting equal yearly installments tells very heavily when the machine is worn and is less effective while the deduction of a diminishing yearly sum depreciates sufficiently at the beginning, when the machine is at its best, and less after its working value is decreased. While this is true, it is purely a matter of account; and it is permissible to adopt a plan named only when the residual value at the expiration of the fixed period is only equal to that of the material.

For instance, if the machine be valued at £100, and is depreciated at 5 per cent per annum on that amount, then, at the end of 20 years, the cost is wiped out. If now the percentage be deducted only from the diminished value annually, then at the end of the time named there will be still 36 per cent of the original value remaining. Now, it is obvious that no machine is worth at the expiration of such a term 36 per cent of its original value, so that the method of computation named is of no value. If, therefore, the allowance is to be deducted from the depreciated amount yearly, then the rate must be higher at the beginning of the term than at any later period, and must, indeed, be on a diminishing scale throughout the whole period, in order to reduce the value to its proper level. On the whole it is better, and simpler, considering the purpose of depreciation, to deduct annually a fixed sum from the original cost, so that there may be some period when the account will close.—[Joseph Nasmith in Cassier's Magazine for July.

Hecla Iron Works.

Ornamental iron and bronze work has become an important factor in the construction of the modern building. A prominent firm in this line is the Hecla Iron Works, of New York, incorporated under the laws of the State of New York, formerly the firm of Poulson & Eger. For nearly a quarter of a century they have been engaged in developing the industry. Their plant is located in Brooklyn Borough, City of New York, and covers 35 city lots. Here every detail of the work is taken care of — designing, draughting, modeling, pattern-making, molding, blacksmithing and forging, assembling and fitting, grille working, grinding and polishing, and blasting, galvano-bronze deposition, electro-plating, and finishing and Bower Barffing. Their various finishes for iron work make it possible to change the appearance of the baser metals into that of more costly ones. Cast or wrought iron when it leaves the finishing department has the finish of solid brass, bronze, copper or silver. The company's process of galvano-bronze deposition, whereby the sharpest detail is obtained without the hand chasing required in work done by casting, effects a great saving in expense, besides giving a faithful reproduction of the artist's model. The officers of the company are: N. Poulson, president; C. M. Eger, vice-president; F. D. Jackson, secretary; F. S. Bellevue, treasurer. The Pittsburg office of the Hecla Iron Works is No. 1405 Park Building.

A deal has been made by which Henry B. Shields of Girard O., and others, become owners of the Wheatland Rolling Mill, one of the oldest plants in the Shenango Valley. The mill, which has been idle for 15 years, was purchased from the Wood heirs, of Pittsburg. It will be started up to roll skelp.

CRANES AND THE POWER USED WITH THEM.*

BY WALTER PITT.

The steam crane is undoubtedly the best type to use where only a single crane is required, or where several portable cranes have to be dealt with whose relative positions may be altered within wide limits, or which may at some future date be transferred to another site. It is simple to work, as economical as most of its rivals, ready at short notice, and requires little permanent work for its installation except in the larger sizes of fixed cranes. When, however, it is a case of an overhead traveler or several fixed cranes, or a number of portable cranes with a limited range of travel, then the consideration of other motive power than steam at once begins.

Shaft-driven overhead-traveling cranes work very well where the motive power is not too far away, but they have disadvantages. The loss in friction is probably the greatest of all systems; the speed at which the transmitting organ (the shaft) can be driven is necessarily very limited, and the tumbler bearings are always inclined to be troublesome.

For conveying power by direct mechanical means, it may be considered an axiom that a quick light drive is always to be preferred to a slow heavy one, and therefore it was a decided step in advance when the quick-running rope-crane came in, and by a process of the survival of the fittest settled down into a well-known type in which the driver sits in a cage below the girders and actuates the machine by shifting open and crossed belts, the speed reduction being made at the crab by worm and wheel.

The introduction of the electric transmission of power marked a noteworthy departure in crane design, and solved in a very satisfactory manner all the difficulties previously experienced in taking the power from the motor to the crane. Electric leads are easy to erect, noiseless, motionless, cheap, and by their means power can be conveyed along routes that would be quite impracticable by any other means, and with very considerable economy. The author puts the latter point last, because although users much appreciate economy, they appreciate convenience a great deal more. Speed and convenience of working take precedence even of coal consumption.

The first electric cranes and travelers were worked by a single motor, often kept running continuously, and the various motions were obtained by shifting belts or other forms of friction clutches. Latterly the practice has been to use a separate motor for each motion. Having got so far, a lesson was taken from tramway practice, and series-wound motors were used instead of the self-governing shunt-wound motor previously necessary.

The series-wound motor, with its big starting torque and its capability of responding to the drivers' views as to speed, has much analogy to the engines of a steam crane regulated by the drivers' hand on the starting valve, and the writer thinks that it is precisely this possibility of using series-wound motors that is the great advantage of the single motor machines. Jib cranes are usually now constructed as two motor machines, one for lifting and one for slueing. The subsidiary motions of jib derricking and traveling are less often used, and can be well worked from the slueing motor by a change of gear.

The reduction of speed from motor to first motion shaft has been effected in every possible manner. Practically two methods survive, worms and cut-gear. The much despised worm is noiseless, and very convenient to apply in many cases, and, if properly designed, even a worm will turn, and that with a very respectable efficiency. The author would remark in this connection that the ordinary formulas for worms will, if used with proper co-efficients of friction, give results well borne out by practice. The next important organ in an electric crane is the controlling gear. Here the tendancy has been lately to adopt liquid resistances, and still more recently to use controllers which are practically tram car controllers. It is a striking feature of electric crane design that whereas at first the old power traveler was the model, the tendancy is now to go to tramway practice, and there are, in fact, many points of analogy between crane and tramway work, especially in all that concerns the starting and accelerating conditions. In Germany considerable attention has been paid to the problem of recovering the energy lost in lowering the load by generating current in the motor. Many of these arrangements are very interesting, but the writer doubts whether here again efficiency of doing the work required does not take precedence of current consumption, and for quick lowering nothing beats a free barrel controlled by a foot-brake.

The hydraulic crane is too well-known to require long notice here. It will probably be always with us, but the electric crane will be a very serious rival. The electric crane itself is more expensive, but the generating and transmitting plant are less costly. Electric cranes are not effected by frost, and they also have the good point that the maintenance repairs are generally within the competency of the man who looks after the crane.

* A paper read at the biennial conference of the Institution of Civil Engineers, London, June 7-9.

Urgent Foreign Demand for American Iron.

In their New York market review under date of July 1, Rogers, Brown & Co., refer to the fresh European demand for American pig iron—a demand that under present conditions cannot be satisfied even at prices very close to those prevailing:

"By far the most striking and significant feature of the market the past week, has been the revival of export demand for American pig iron. Offers have been received in blocks of five and ten thousand tons for each of the leading European ports, and while the prices are not quite up to a parity of the newest Birmingham prices, they are, nevertheless, very close to them, and indicate that if the iron could be furnished, full American prices could be realized. The sad fact is, the iron can not be furnished. It is doubtful if Europe could buy 10,000 tons more of No. 3 foundry Alabama iron for shipment this year, at any price whatever. The incredulity of the foreigners as to the genuineness of our improvement in America has been curiously persistent. The bear operations of two or three leading firms in Glasgow, extending over a term of years, have thoroughly impressed both makers and consumers with the idea that any advance in prices in European markets would be quickly checked by a flood of cheap American iron. The awakening to this fallacy has been slow but sure. It has broken one of the firms mentioned, and cost the others large sums. It has put up the English and German markets to a parity with our own, and created a new and hopeful sentiment throughout Europe. The reflex action of all this upon our own markets need not be dwelt on. The failure to get expected supply of iron from America will throw a larger demand upon English, Scotch and German producers."

W. J. Early & Sons, Ltd.

The above company, operating the Standard Foundry, Pittsburg, 804-12 Sarah st., South Side, has been engaged in business for the past 10 years. It manufactures rolling mill machinery, ice plant, and glass house castings of all descriptions, and glass molds and glass mold plungers are a specialty. The daily melting capacity is from 10 to 12 tons of iron. Since the company started up it has not lost a day except holidays and Sundays. Regular employment is given to 35 men.

The officers of the company are: W. J. Early, president; W. A. Early, secretary and treasurer; Jas. S. Early and John N. Early, managers. The equipment includes a 15-ton crane, 6-ton crane, 20-ton cupola, and 2 core ovens of approved design.

On June 26 the Bethlehem Steel Co. formally took over the property of the Bethlehem Iron Co., Bethlehem, Pa., the latter company having leased its works, etc., to the new incorporation. The officers of the Bethlehem Steel Co. are: Robert P. Linderman, president; Edward M. McIlvain, vice-president; Abraham S. Schropp, secretary; C. O. Brunner, treasurer; R. W. Davenport, general superintendent; Owen F. Leibert, chief engineer; Charles P. Coleman, purchasing agent. The company is making a specialty of steel castings to a greater extent than before. Its experience in government work has fitted it peculiarly for the manufacture of high grade castings, though until now it has not undertaken general contracts. It has every facility for the manufacture of steel castings of the largest dimensions and of the highest quality.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market, and Some of Their Wants:—

The United Boiler Co., Girard, O., is reported in the market for a pair of rolls and punch and shearing machine.

The General Fire Equipment Co., Charlotte, N. C., will buy a second hand 10-inch or 12 inch power pipe-threading machine.

The Sotter Brothers' Boiler Mfg. Co., of Pottstown, Pa., recently incorporated with a capital stock of $50,000, has organized by the election of Jacob C. Sotter, president and general manager; H. M. Lessif, secretary and W. A. Knapp, treasurer.

The Logan Mfg. Co., Phoenixville, Pa., has been organized to manufacture iron and steel, with capital of $50,000. Directors are George F. Huff, J. Howard Rhodes, and Richard H. Huen, Jr.

The Empire Mfg. Co., Lockport, N. Y., is in the market for shafting, gearing and pulleys.

At St. Louis the J. W. Garratt Brass Foundry Co., filed articles of incorporation with a capital stock of $10,000, all paid. The stockholders are Charles Erickson, Frank Haggenjos and Mrs. Belle Garratt.

The new Willimantic (Conn) Machine Co., was organized last week. George E. Stiles, E. H. Holmes, C. E. Leonard, W. H Bradbury, D. P. Ticknor, A. I. Bill, and E. A. Buck were chosen directors, and the directors elected the following officers: President, George E. Stiles; secretary and treasurer, E. H. Holmes.

New Construction:—

A new plant in place of the one burned will be erected by the Birmingham (Ala.) Machine & Foundry Co.

An addition is being built to the foundry of the C. B. Cottrell & Sons Co., Westerly, R. I.

The pickling room of the National Enameling & Stamping Co's plant at Granite City, Ill., will be extended 50x100 feet, and two new coal sheds, 40x100 feet, will be erected.

The New York Steel & Wire Co., incorporated recently with $200,000 capital and a bonded indebtedness of $100,000, will at once begin the erection of a steel plant at Astoria, L. I. The company proposes to make a specialty of the manufacture of wire rope, and will also make open-hearth steel, wire nails and merchant iron and steel. The $300,000 capitalization may be increased. The president is James M. Waterbury, and the treasurer A. Van Horne Ellis. The office is at 69 South st., Long Island City.

There is talk of an independent rolling mill at Ironville, Toledo. The deal is being negotiated by A. W. Houston, ex-president of the Maumee Rolling Mill Co.

The Stewart Iron Works, of Cincinnati, have the contract for the iron work of a new penitentiary to be erected at Syracuse, N. Y. It includes over 400 modern steel cells, equipped with the Stewart patent locking and operating device for all cells.

An addition 40x40 feet is being built to the plant of the American Tin Plate Co., at Connellsville, Pa. It will contain a machine shop and blacksmith shop.

The E. P. Allis Co., Milwaukee, is about making a number of additions. The first is a foundry to cost $12,000.

The Shenango Machine Co.'s new plant at Sharon, Pa, will be one of the most improved of its kind in that district. It is being equipped with new engine, boilers, dynamos, etc. The total cost will be nearly $25,000.

At Troy, N. Y., a plant is being erected for the new boiler-making firm of Sutherland & Kelly.

The Gry Iron Co., of Mt. Joy, Pa., has secured land for the erection of an additional foundry.

Fires and Accidents:—

At Greenfield, Mass., the Rodney Hunt Machine Co.'s pattern department was damaged $10,000 by fire.

At Lynchburg, Va., the foundry department of the Glamorgan Pipe & Foundry Works was destroyed by fire June 27, with valuable patterns. Loss, $10,000.

The works of the Patton Mfg. Co., Columbus, O., were partly burned June 28, with $10,000 loss. Hollowware, acetylene gas machinery and plumbing fixtures were manufactured.

At Philadelphia, the foundry of the Geger Mfg. Co. was damaged to the extent of $1,500 by fire, June 24.

Power Equipment and Machine Tools:—

Westinghouse, Church, Kerr & Co., New York, are equipping with electricity the steel casting plant of Isaac G. Johnson & Co., Spuyten Duyvel. The new installment includes a Westinghouse compound steam engine, direct connected to a 75 kw, 250 volt Westinghouse generator. This plant will supply power for operating Westinghouse electric motors in several machine shops, and for supplying light for the whole works.

Among a number of orders placed through A. Sorge, Jr., & Co., of Chicago, last week, with the Harrison Safety Boiler Works, of Philadelphia, for Cochrane feed water heaters, are the following large units: Two of 5,000 h. p. and three of 4,000 h. p. each for the Illinois Steel Co., South Chicago; one of 4,000 h. p. for the Deering Harvester Co., one of 4,000 h. p. for the Commonwealth Electric Co.; also one of 3,000 h. p. and one of 2,000 h. p. for the McCormick Harvesting Machine Co., all of Chicago. Besides these large units, Messrs. A. Sorge, Jr., & Co. report a considerable number of orders for smaller sizes.

The Westinghouse Electric & Mfg. Co. has received a further order for an electrical installment for Cuba. The Cuban Electric Co. is equipping the railroad from Regla to Guanabacoa, in the vicinity of Havana, with an electric traction system, to replace the steam engines and cars previously used. Two 150 kilowatt Westinghouse "engine type" generators will be provided for the central power house. These will be direct-connected to steam engines, working at 200 revolutions per minute. The generators will be protected by two Wurts tank lightning arrestors. An elaborate switchboard will be provided, having two panels to manipulate the generators, one load panel, and one feeder panel. The railroad carries passengers from the ferry terminal at Regla to the City of Guanabacoa, for which four large and powerful cars are being built. Each car will be equipped with two 50 h. p. Westinghouse motors, giving a 100 h. p. to each car, capable of running them at a speed of 30 miles an hour.

The *American Machinist*, in its review of the machinery market says: "We are notified by a Western tool works, who ask us to withhold their name, that they have advanced prices 15 per cent, to take effect immediately. They seem to think that higher prices are needed, for they hope that the influence of their action will 'tend to bring other machine-tool builders to their senses.' A New York machine-tool selling firm report that in charging up their accounts for May (this includes orders that have been filled, not those which have been taken but remain unfilled), the total was larger than for any previous month in the year. The first three weeks in June exceeded the corresponding portion of May, and orders are now being taken more rapidly than they are being shipped. A healthy sign noticed by this firm is that within the last week they have disposed with several odds and ends, including some of the oldest tools in stock, indicating that the smaller fry of buyers are prospering and are scouring the market."

The Brown Hoisting & Conveying Machine Co., of Cleveland, which builds specially designed cranes for ship yards, has recently added to its orders in this line a contract from Vickers' Sons & Maxim, of England, for four balanced cantilevers of the ship building kind. Two of the cranes will be mounted on the recently patented Brown steel truss, while the remaining two will be placed on the ground. The Brown company has also received from the Austrian government a contract for a ship building crane to be erected at the government yards at Triest, Austria. Of the company's contracts in this country, one of the most important is for a crane for work on two battleships building at the yard of the Cramps, in Philadelphia, and for two other similar cranes that will soon be in operation at the same yard. The battleship crane is mounted on the form of steel trestle heretofore mentioned. It has a clear travel of 725 feet up and down the trestle and a lifting capacity of 15 tons at 60 feet or 5 tons at 95 feet on either arm.

W. C. Temple, of the Cahall Sales Department, Pittsburg, is quoted as follows on the advances in the price of boilers, at the rate of 10 or 15 per cent a month for several months: "The prices on every description of our boilers have been advanced 50 per cent since the 1st of March. We thought that the June advance would check buying, but in the second

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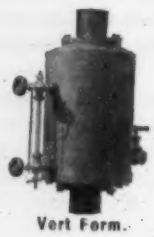

Vert Form.

Only a limited quantity of oil will build up on the surfaces within an oil separator (witness engine cylinders and exhaust pipes that have been in use one-ten-twenty years); the rest of the oil will either pass on through with the current of steam, or, **if the Separator is Properly Designed**, the oil will drain away clear of the current. Appliances that act as "oil retarders"—those which foul up—must be cleaned, and any engineer using those containing wire screens, a large number of retarding baffles, capillary pipes or tubes, or spiral wires, etc., will tell you that it is no fun to clean them. Centrifugal action cannot be brought into play to obtain separation unless the steam water or oil are **Boxed and Whirled** many thousand revolutions per minute. The **COCHRANE OIL SEPARATORS** accomplish separation in a plain, practical and common-sense way. Those put out six or seven years ago giving the same good satisfaction as when first put in, with **Never a Cleaning.** Their efficiency is really remarkable.

HARRISON SAFETY BOILER WORKS,
Clearfield and 17th Streets, PHILADELPHIA, PA.

week of June we received orders amounting to over 30,000 h. p. Now we are compelled to make still another advance, and there is apparently no diminution in the volume of business offering. I do not see how we are possibly to fill these accumulating orders. Our works have been running day and night since the 1st of March, and we have enough orders on hand to run us into the latter part of next year. We shall simply have to lease, buy, or erect new works."

General Industrial Notes:—

At Kokomo, Ind., an addition 24x70 feet is being built to the plant of the Rockford Bit Co.

The Harrisburg (Pa.) Foundry & Machine Co.'s new plant is now under roof and machinery is being placed. Work will begin at once on a new blacksmith shop 30x100 feet.

The Patterson Foundry & Machine Co., organized at East Liverpool, O., has taken over the plant of Monroe Patterson and the works of A. J. Boyce and will continue the manufacture of pottery and brick yard machinery.

The plant of the Alcania Tin Plate Co., at Avonmore, Pa., is expected to be in operation early in July and 150 men will be given employment. At least 50 more houses will be needed in Avonmore by August 1.

The Belfont stack at Ironton, O., is about ready to go in again.

The Susquehanna Iron & Steel Co., of Columbia, Pa., has elected directors as follows: Dr. L. S. Filbert, Sen. Charles A. Porter, Wm. Patton, John Q. Denny, Wm. Staecy, Kennedy Crossan, C. C. Kauffman, Wm. C. Martin and J. Wesley Supplee.

The American Steel & Wire Co.'s mills at Anderson, Ind., have been closed in all departments to await the completion of repairs to the rod mill. Resumption is expected about July 10.

The Dorner Truck & Mfg. Co., Cleveland, is figuring on removing to Richmond or Logansport, Ind.

The Wellston Iron & Steel Co., of Wellston, O., has leased Madison furnace, owned by Clare, Duduit & Co., at Rempel, O. The stack is 37x9½ feet, was built in 1854, and has an annual capacity of 31,050 tons of charcoal iron.

The Lake Erie Iron Co., Cleveland, whose rolling mills were sold to the Republic Iron & Steel Co., still operates its own nut and bolt plant.

The Bethlehem Steel Co. has started its puddle mill at South Bethlehem, Pa.

Wm. McIntyre & Sons, of Sharon, Pa., have been given the contract for the erection of a brick engine house, 44x38 feet, for the Spearman Furnace, Sharpsville, Pa. They will also build a power house for the Shenango Machine Co., Sharon.

The new steel plant of the National Steel Co., at Mingo Junction, O., is in readiness to start up.

The Blue Mountain Iron & Steel Co., of Baltimore, has been incorporated by Jerome Keeley, of Philadelphia; Ogden A. Kirkland, Abraham Sharp, William B. Price and Edward C. Pritchett, of Baltimore. Mr. Keeley will be president and manager. The company purposes to operate the Catoctin Furnaces in Frederick County, Maryland.

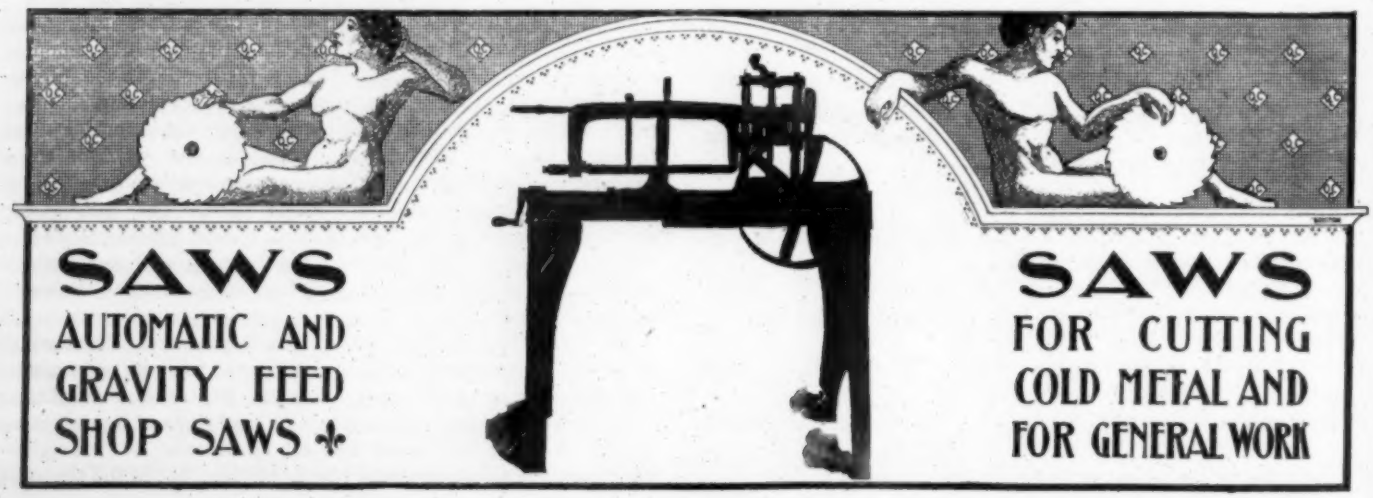
The Midland Steel Co. Muncie, Ind., is expending over $30,000 on improvements. A 15 ton and a 25-ton crane will be put in and four new soaking pits built.

The Wabash Bridge & Iron Co., Wabash, Ind., has declined to join the consolidation of bridge companies.

The foundry of J. W. Foley & Co., Cincinnati, is crowded with work and 30 more molders could be given places.

P. W. Herzog, of Minneapolis, and R. S. Chase, of Duluth, have secured control of the Interstate Malleable Iron Works, at Duluth, Minn., and have reopened them. The company will now be called the Duluth Iron Co.

For the first time in years there will be no complete shutdown of the implement plant of the Aultman, Miller & Co., at Akron, O. The company is about to put on the market the corn harvester perfected by its late Superintendent Lewis Miller, and the manufacture of this machine will keep part of the plant in operation while the mower and reaper depart-



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DETROIT, MICH.

ments are closed for repairs, in the latter part of July and through August.

A sketch of the Champion Iron Co., Kenton, O., and its operations, printed in a recent issue of a local paper, notes that when the company started in business in 1875 as the Champion Iron Fence Co., it occupied but 750 square feet of floor space, while to-day the working floors aggregate 72,000 square feet. From a few men at the start the pay rolls have increased to 350 men in times of full operation. The structural iron department occupies 18,000 square feet of space and employs 80 men. The nail department is one of the largest in the country. Fencing, railing and cresting also constitute a department. The foundry employs 40 molders, and its two cupolas have a capacity of 25 tons a day. Dr. G. J. Carter, is president and treasurer of the company; L. A. Ansley, vice-president; J. L. Simpson, secretary, and T. A. Taylor, superintendent.

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The date of the excursion, Aug. 10th, is the most convenient for an outing. Business is quiet at this season, crops are gathered, and office, store and farm duties are not exacting. The thermometer usually reaches the highest point about this time. It will be a pleasing diversion to spend a week's vacation in the invigorating ocean breeze and experience the unlimited pleasures at the command of the summer idler by the sea.

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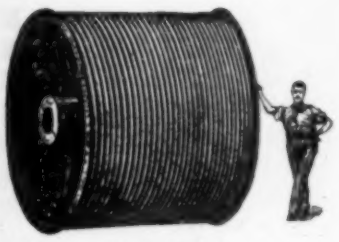

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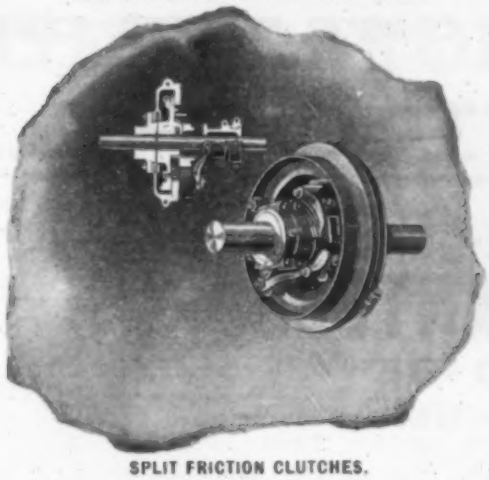

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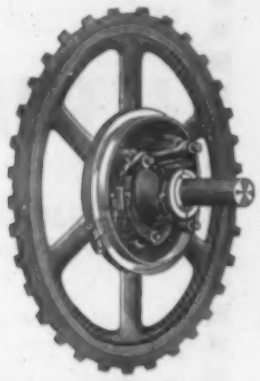

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Akron, Canton & Wheeling...	*10:20 A M	*3:30 P M
Akron, Canton & Chicago.....	*8:05 A M	*6:35 P M
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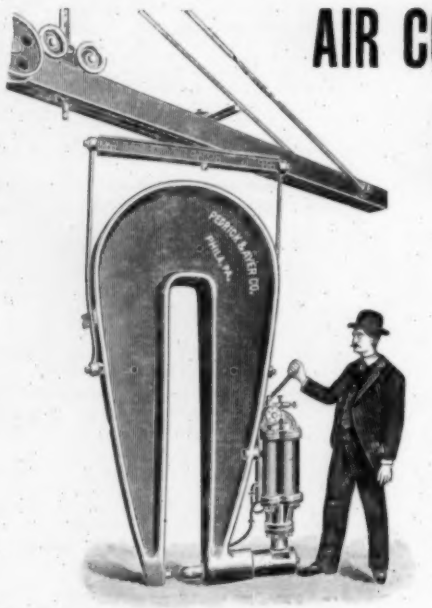

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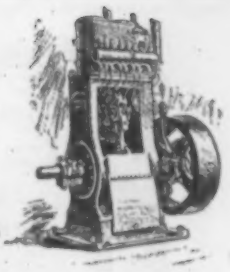

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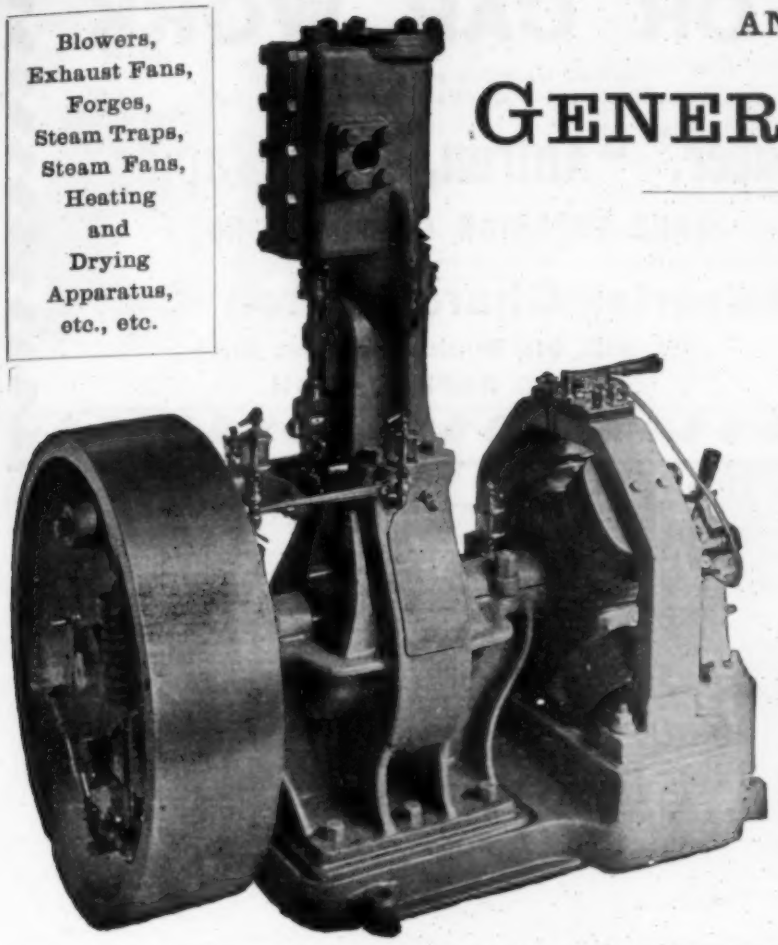

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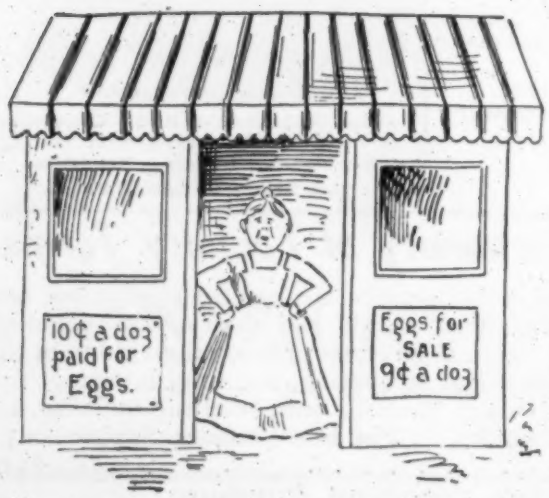

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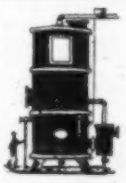

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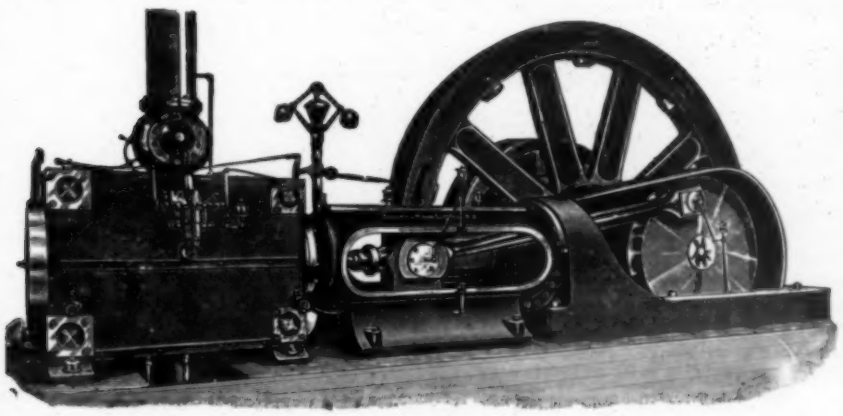

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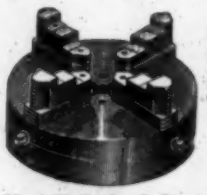

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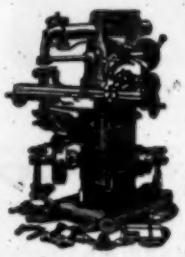

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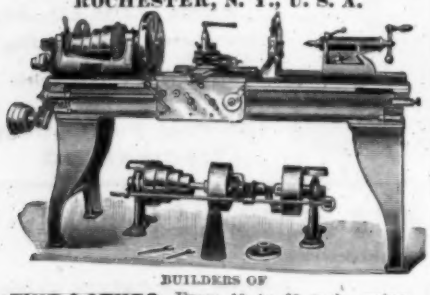

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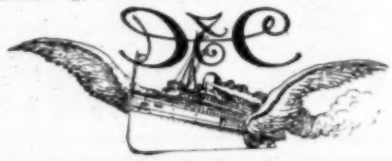

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South Bound.			Central Standard.	North Bound.		
15	13	11	Lorain Branch	12	14	16
P.M.	P.M.	A.M.	LV. AR.	A.M.	A.M.	P.M.
4:25	2:25	6:27	Lorain	9:15	11:35	7:30
4:40	2:39	6:44	Elyria	9:00	11:21	7:16
4:56	2:55	7:04	Grafton	8:43	11:07	6:58
5:15	3:12	7:23	Lester	8:25	10:50	6:40
5	3	1	Main Line	2	4	6
5:30	2:25	7:20	Cleveland	8:30	11:50	7:15
5:47	2:41	7:36	Brooklyn	8:14	11:34	7:01
6:42	3:26	8:22	Lester	7:29	10:49	6:19
6:52	3:35	8:30	Medina	7:16	10:37	6:07
7:05	3:46	8:41	Chippewa La	7:04	10:26	5:55
7:20	4:01	8:56	Sterling	6:48	10:12	5:40
8:09	4:46	9:45	Massillon	6:00	9:23	4:54
8:55	5:31	10:34	Canal Dover	5:11	8:36	4:10
9:02	5:38	10:41	New Philade	5:04	8:28	4:03
9:20	6:05	11:25	Uhrichsville	4:45	8:10	3:45
.....	8:10	1:30	Bridgeport	.....	6:05	1:40
.....	8:25	.....	Bellaire	.....	5:50	.....
P.M.	P.M.	P.M.	AR. LV.	A.M.	A.M.	P.M.

No. 9 leaves Lorain 9:50 a.m., Elyria 10:05, Grafton 10:21; arrives Lester Junction 10:40. No. 10 leaves Lester Junction 3:25 p.m., Grafton 3:42, Elyria 3:57; arrive Lorain at 4:10 p.m.

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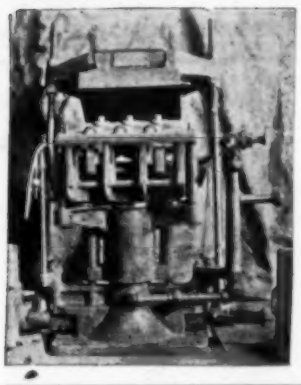

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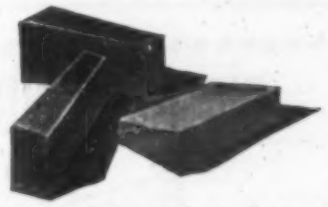

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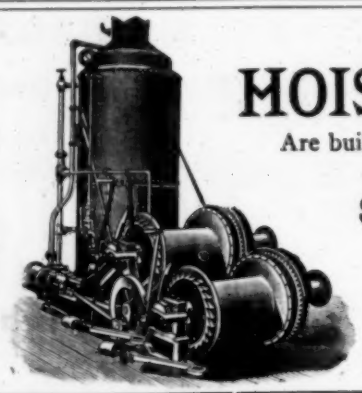

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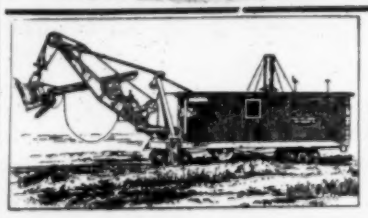

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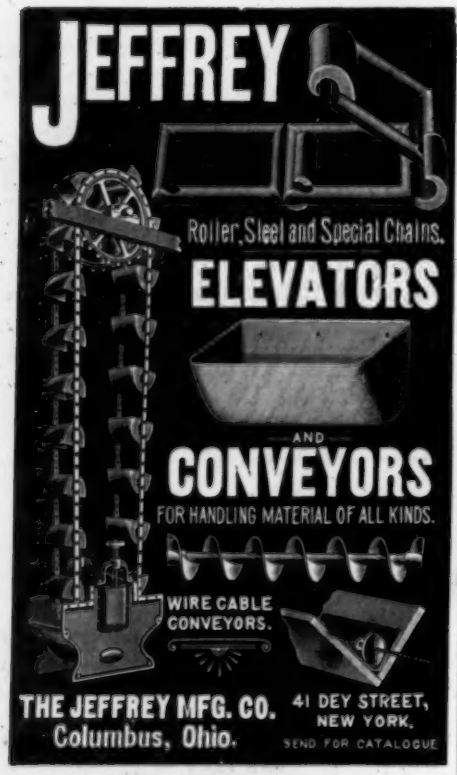

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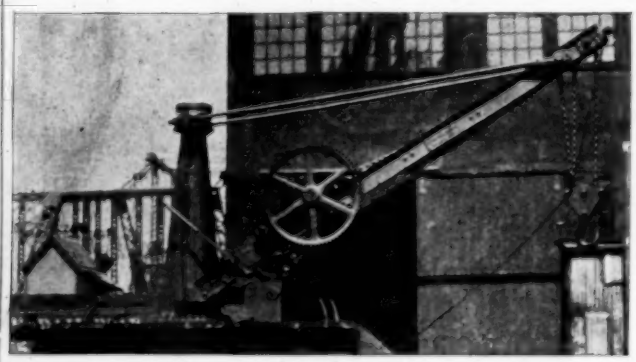

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	Forges. Gas Furnaces.
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	Feed Water Heaters.
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	Emery, Emery Wheels.
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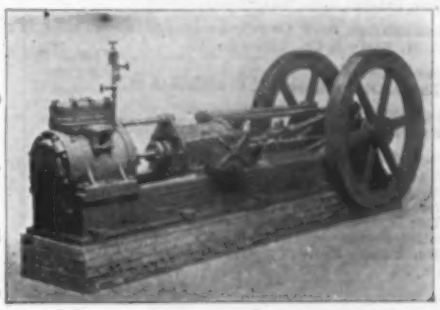

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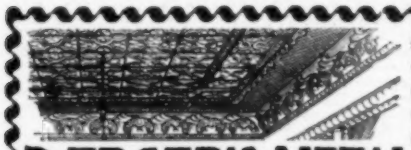

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Excelsior Iron Works Co., Cleveland, O.

Emery and Corundum Wheels—
C. H. Besley & Co , Chicago, Ill.
J. Wendell Cole Columbus and Chicago.
Northampton Emery Wheel Co., Chicago, Ill.
Cleveland Tool & Supply Co., Cleveland. O.
W. P. Davis Machine Co., Rochester, N. Y.

Emery Wheel Machinery—
J. Wendell Cole, M. E., Columbus, O., or Chicago, Ill.
C. H. Besly & Co., Chicago, Ill.
Northampton Emery Wheel Co., Chicago, Ill.
Cleveland Tool & Supply Co., Cleveland, O

Engineers and Contractors—
Heyl & Patterson, Pittsburg, Pa.
Meehan Boiler & Construction Co., Lowellville Ohio.
E. E. Erickson, Pittsburg, Pa.
John T. Jones & Co., Chicago, Ill.
Riter-ConleyMfg. Co., Pittsburg, Pa.
Jeffrey Mfg. Co., Columbus, O.
Alex Laughlin & Co., Pittsburg, Pa.
We Fu Go Co., Cincinnati, O.
James Bonar & Co., Pittsburg, Pa.

Engine Packing—
Jenkins Bros., New York City.
C. H. Besly & Co., Chicago, Ill.

Engineers' Supplies—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

Engine Lathes—
U. Baird Machinery Co., Pittsburg, Pa.

Engines (Oil)—
The Aultman Co., Canton, O.

Engines (Steam)—
W. P. Davis Machine Co., Rochester, N. Y.

Wm. Tod & Co., Youngstown, O.
B. F. Sturtevant Co., Boston, Mass.
The Edward P. Allis Co,, Milwaukee, Wis.
The Hooven, Owens & Rentschler Co., Hamilton, O.
Lane & Bodley Co., Cincinnati, O.
The Aultman Co., Canton, O.
Geo. B. Sennett Co., Youngstown, Ohio.
I. & E. Greenwald Co., Cincinnati, O.
Webster Camp & Lane Machine Co., Akron, O.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
Fraser & Chalmers, Chicago, Ill.
Southwark Foundry & Machine Co., Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.

Engravers and Electrotypers—
Central Electrotype & Engraving Co., Cleveland, O.
National Engraving Co., Cleveland, O.,
Samuel R. Mason, Cleveland, O.

Exhaust Heating Apparatus—
B. F. Sturtevant Co., Boston, Mass.

Fans—
American Gas Furnace Co., New York City.
B. F. Sturtevant Co., Boston, Mass.

Feed Water Heaters and Purifiers—
Harrison Safety Boiler Works, Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.
We Fu Go Co., Cincinnati, O.
Austin Separator Co., Detroit, Mich.

Files, Makers of—
C. H. Besly & Co., Chicago, Ill.

Fire Brick and Clay—
J. V. Rose, Sharon, Pa.
Union Mining Co., Mt. Savage, Md.
Clearfield Fire Brick Co., Clearfield,
Dover Fire Brick Co., Cleveland. Pa.
F. B. Stevens, Detroit, Mich.
Chicago Fire Clay Product Co., Chicago, Ill.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Detroit, Mich.
Garden City Sand Co., Chicago, Ill.
A. F. Smith & Co., New Brighton, Pa.

Fire Proof Covering—
C. H. Besly & Co., Chicago, Ill.

Flexible Shafts—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

Flue Cleaners—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

Foot and Power Lathes—
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington Son & Co., Philadelphia, Pa.

Foundries—
Wm. Tod & Co., Youngstown, O.
Seaman, Sleeth Co., Pittsburg, Pa.
The Lane & Bodley Co., Cincinnati, O.
Hooven, Owens & Rentschler Co., Hamilton, O.
W. A. Jones Foundry Co., Chicago.
Jeffrey Mfg. Co., Columbus. O.
Brass Founders' Supply Co., Newark, N. J.
The Aultman Co., Canton, O.
Riverside Foundry Co., Cleveland, O.
I. & E. Greenwald Co., Cincinnati, O.
Wheeling Mold & Foundry Co., Wheeling, W.Va.
Excelsior Iron Works Co., Cleveland, O.

Foundry Supplies—
Clearfield Fire Brick Co., Clearfield, Pa.
The Ohio Sand Co., Conneaut, O.
Union Mining Co., Mt. Savage, Md.
Dover Fire-Brick Co., Cleveland, O.
A. F. Smith & Co., New Brighton, Pa.
Tabor Mfg. Co., Elizabeth, N. J.
F. B. Stevens, Detroit, Mich.
Millett Core Oven Co., Brightwood, Mass.
Cleveland Facing Mill Co., Cleveland. O.
Garden City Sand Co., Chicago, Ill.
Chicago Fire Clay Product Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.
Vulcan Mfg. Co., Pittsburg, Pa.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth, O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
J. V. Rose, Sharon, Pa.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.
Henry L. Schwarzenberg, Cleveland, O.

Foundry Facings—
Cleveland Facing Mill Co., Cleveland, O.

Forgings—
Cleveland City Forge & Iron Co., Cleveland, O.
Bethlehem Iron Co., South Bethlehem, Pa.
Bræburn Steel Co., Braeburn, Pa.
Wyman & Gordon, Worchester, Mass.

Friction Metal—
C. H. Besly & Co., Chicago, Ill.
Swarts Metal Refining Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
Merchant & Co., Inc., Philadelphia, Pa.
F. R. Phillips' Sons Co., Philadelphia, Pa.
Henry L. Schwarzenberg, Cleveland, O.

Furnaces—
Playford Stoker Co., Cleveland, O.

Furnace Linings—
Union Mining Co., Mt. Savage, Md.

Fuel Oil Burners—
W. S. Rockwell & Co., New York City.

Galvanized Iron—
Apollo Iron & Steel Co., Pittsburg, Pa.

Galvanizers—
Ætna-Standard Iron & Steel Co., Bridgeport, O
Apollo Iron & Steel Co., Pittsburg, Pa.

Galvanizing Pots—
The Wm. B. Pollock Co., Youngstown, O.

Gauge Cocks—
James Bonar & Co., Pittsburg, Pa.

Gearing.
I. & E. Greenwald Co., Cincinnati, O.
The R. D. Nuttall Co., Allegheny, Pa.
The Van Dorn & Dutton Co., Cleveland, O.

Gear Cutting—
The R. D. Nuttall Co., Allegheny, Pa
Brainard Milling Machine Co., Hyde Park, Mass.
The Van Dorn & Dutton Co., Cleveland, O.

Gear Cutters—
Brainard Milling Machine Co., Hyde Park, Mass.

Gear Lubricants—
The Ironsides Company, Columbus, O.

Grease—
A. F. Boettcher, Rowlands, Pa.

Grindstones—
C. H. Besly & Co., Chicago, Ill.

Graphite Paint—
Jos. Dixon Crucible Co., Jersey City N. J.

Grate Bars—
Geo. B. Sennett Co., Youngstown, Ohio.

Gray Iron Castings—
W. A. Jones Foundry Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O
Brass Founders' Supply Co., Newark, N. J.

Hack Saws—
Millers Falls Co., New York City.
Q & C Co., Chicago, Ill.

Hangers—
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
I. & E. Greenwald Co., Cincinnati, O.

Harness Snaps—
Covert Mfg. Co., West Troy, N. Y.

Hoists—
Edwin Harrington Son & Co., Philadelphia.
Reading Crane & Hoist Works, Reading, Pa.
The Lane & Bodley Co., Cincinnati, C.
The Aultman Co., Canton, O.
Lidgerwood Mfg. Co., New York City.

Heaters and Purifiers—
Harrison Safety Boiler Works, Philadelphia.
James Bonar & Co., Pittsburg, Pa.
We Fu Go Co., Cincinnati, O.
Austin Separator Co., Detroit, Mich.

Heating and Ventilating Apparatus
B. F. Sturtevant Co., Boston.

Heavy Hardware—
C. H. Besly & Co., Chicago, Ill.
Parkhurst & Wilkinson Co., Chicago, Ill.

Hoisting Engines—
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.
Lidgerwood Mfg. Co., New York City.
The Aultman Co., Canton, O.
Webster, Camp & Lane Machine Co., Akron, O.
Excelsior Iron Works Co., Cleveland, O.

Hoisting Machinery—
Link-Belt Machinery Co., Chicago, Ill.
Reading Crane & Hoist Works, Reading, Pa.
Jeffrey Mfg. Co., Columbus, O.
The Lane & Bodley Co., Cincinnati, O.
Excelsior Iron Works Co., Cleveland, O.
Earl C. Bacon, New York City.
Lidgerwood Mfg. Co., New York City.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.
Webster, Camp & Lane Machine Co., Akron, O.
Robins Conveying Belt Co., New York City.

Horse Shoes—
Phoenix Horse Shoe Co., Joliett, Ill.

Hotels—
United States Hotel Co., Cleveland, O.

Hydraulic Machinery—
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.

Impulse Cleaners—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

Ingot Molds—
Lorain Foundry Co., Lorain, O.

Injectors—
C. H. Besly & Co., Chicago, Ill.
Manning, Maxwell & Moore, New York City.
James Bonar & Co., Pittsburg, Pa.

Insurance Companies—
Hartford Steam Boiler I. & I. Co., Hartford, Ct

Iron Buildings—
Shiffler Bridge Co., Pittsburg, Pa.
Riter-Conley Co., Pittsburg, Pa.

Iron Nails and Steel—
Bethlehem Iron Co., South Bethlehem, Pa.
C. H. Besly & Co., Chicago, Ill.
H. H. Stroud & Co., Chicago, Ill.
Parkhurst & Wilkinson Co., Chicago, Ill.

Iron and Steel Roofing—
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.

Iron Ore—
Lake Superior Consolidated Iron Mines New York City, N. Y.
Oglebay, Norton & Co., Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
Drake Bartow & Co., Cleveland, O.
Pickands, Mather & Co., Cleveland, O.

Iron Working Tools—
H. Bickford, Lakeport, N. H
C. H. Besly & Co., Chicago, Ill.
The F. B. Shuster Co., New Haven, Conn.
U. Baird Machinery Co., Pittsburg, Pa.
Fox Machine Co., Grand Rapids, Mich.
Armstrong Bros. Tool Co., Chicago, Ill.
The Armstrong Mfg. Co., Bridgeport, Conn.
Bickford Drill & Tool Co., Cincinnati, O.
Skinner Chuck Co., New Britain, Conn.
Cleveland Tool & Supply Co., Cleveland, O.
Brainard Milling Machine Co., Hyde Park, Mass.
Baush & Harris Machine Tool Co., Springfield, Mass.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.
Cleveland Ball & Screw Co., Cleveland, O.
W. P. Davis Machine Co., Rochester, N. Y.

Link Belting—
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.

Ladles—
The S. Obermayer Co., Cincinnati, O.

Lathes—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.

Lubricators—
A. F. Boettcher, Rowlands, Pa.

Machinery Name Plates—
August Becker, Boston, Mass.

Machinists' Tools and Supplies—
W. P. Davis Machine Co., Rochester, N. Y.
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bertsch & Co., Cambridge City, Ind.
Fox Machine Co., Grand Rapids, Mich.
Armstrong Bros. Tool Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Parkhurst & Wilkinson Co., Chicago, Ill.
Skinner Chuck Co., New Britain, Conn.
Cleveland Tool & Supply Co., Cleveland, O.
Baush & Harris Machine Tool Co., Springfield, Mass.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, New York City.
Western Mfg. Co , Springfield, O.

Machine Screws—
C. H. Besly & Co., Chicago, Ill.

Machine Shops—
The R. D. Nuttall Co., Allegheny, Pa.
The Lane & Bodley Co., Cincinnati, O.
H. A. Streeter, Chicago, Ill.

Machinery and Tool Steel—
C. H. Besley & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa
Sanderson Bros. Steel Co., Cleveland, O.
Byron H. White, Chicago, Ill.
Morris & Bailey Steel Co., Pittsburg, Pa.

Magnesia Covering—
C. H. Besly & Co., Chicago, Ill.

Malleable Castings—
Acme Malleable Iron Works, Buffalo, N. Y.

Manufacturing Chemists.
We Fu Go Co., Cincinnati, O.

Manufactured Iron & Steel—
Bourne-Fuller & Co., Cleveland, O.
Cleveland Rolling Mill Co., Cleveland, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Parkhurst & Wilkinson Co., Chicago, Ill.
Ohio Steel Co., Youngstown, O.

Metal Bearings—
C. H. Besly & Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
Merchant & Co., Inc., Philadelshia, Pa.
Swarts Metal Refining Co., Chicago, Ills.
F. R. Phillips' Sons Co., Philadelphia, Pa.
Henry L. Schwarzenberg, Cleveland, O.

Milling Machines—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Fox Machine Co., Grand Rapids, Mich.
Brainard Milling Machine Co., Hyde Park, Mass
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, NewYrok City.

Mining Machinery—
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.
Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co., New York City.
Wm. Cramp & Sons, Philadelphia, Pa.
The Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.
Webster, Camp & Lane Machine Co., Akron, O.
Fraser & Chalmers, Chicago, Ill.
Robins Conveying Belt Co., New York City.
Excelsior Iron Works Co., Cleveland, O.

Mine Pumps—
F. M. Prescott Steam Pump Co., Milwaukee, Wis.

Molding Machines—
Tabor Mfg. Co., Elizabeth, N. J.

Molding Sand—
Ohio Sand Co., Conneaut, O.
F. B. Stevens, Detroit, Mich.
Garden City Sand Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.

Name Plates—
August Becker, Boston, Mass.

Nickel Plating Outfits—
Northampton Emery Wheel Co., Chicago, Ill.

Nuts and Bolts
Upson Nut Co., Cleveland, O.

Oilless Bearings—
C. H. Besly & Co., Chicago, Ill.

Oil Burners—
W. S. Rockwell & Co., New York City.

Oil Cups—
C. H. Besly & Co., Chicago, Ill.
James Bonar & Co., Pittsburg, Pa.
Oil Filters—
James Bonar & Co., Pittsburg, Pa.
Oil Pumps—
C. H. Besly & Co., Chicago, Ill.
Oil Separators—
Harrison Safety Boiler Works, Philadelphia, Pa.
Austin Separator Co., Detroit, Mich.
Ore Crushers—
The Edward P. Allis Co., Milwaukee, Wis.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.
Ore Screens—
Rob't Aitchison Per. Metal Co., Chicago, Ill.
Harrington & King Per. Co., Chicago, Ill.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.
Packing—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
Paint—
Iron Clad Paint Co., Cleveland, O.
Jos. Dixon Crucible Co., Jersey City, N. J.
Standard Paint Co., New York, City.
The Shearer-Peters Paint Co., Cincinnati, O.
Pattern Works—
Gobeille Pattern Co., Cleveland, O.
Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago, Ill.
Fraser & Chalmers, Chicago, Ill.
Pig Iron—
Clinton Iron & Steel Co., Pittsburg.
Forster, Waterbury & Co., Chicago, Ill.
Bourne-Fuller Co. Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
E. H. Stroud & Co., Chicago, Ill.
F. B. Stevens, Detroit, Mich.
McKeefrey & Co., Leetonia, O.
Superior Charcoal Iron Co., Grand Rapids, Mich
Spearman Iron Co., Sharpsville, Pa.
The Brier Hill Coal & Iron Co., Youngstown, O.
Pickands, Mather & Co., Cleveland, O.
Pipe Cleaners—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.
Pipe Covering—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
Pipe Cutting and Threading Machines—
The Armstrong Mfg. Co., Bridgeport, Conn.
Planers—
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Danielson Machine & Tool Co., Cleveland, O
Manning, Maxwell & Moore, New York City.
Plates—
Enterprise Boiler Co., Youngstown, O.
Plumbers' and Gas Fitters' Supplies—
C. H. Besly & Co., Chicago, Ill.
Pneumatic Appliances—
Clayton Air Compressor Works, New York.
Pneumatic Tools.—
American Pneumatic Tool Co., New York City
Q & C Co., Chicago. Ill.
Portable Forge—
C. H. Besly & Co., Chicago, Ill.
B. F. Sturtevant Co., Boston. Mass.
Vulcan Mfg. Co., Pittsburg, Pa.
Power Drop Hammers—
Baush & Harris Machine Tool Co., Springfield Mass.
Power Presses—
Bertsch & Co., Cambridge City, Ind.
Fox Machine Co., Grand Rapids, Mich.
E. Konigslow & Bro. Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.
Power Transmission Machinery—
Jeffrey Mfg. Co., Columbus, O.
The Lane & Bodley Co., Cincinnati, O.
E. A. Delano, Chicago. Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
I. & E. Greenwald Co., Cincinnati, O.
Presses—
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co. Chicago Ill.
E. Konigslow & Bro. Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.
Pressure Gauges—
The Bristol Co., Waterbury, Conn.
James Bonar & Co., Pittsburg, Pa.
Pulleys—
W. A. Jones Foundry Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlins, Ltd., Pittsburg, Pa
I. & E. Greenwald Co., Cincinnati, O.
Pumps (Steam)—
The Edward P. Allis Co., Milwaukee, Wis
Blakeslee Mfg. Co., Du Quoin, Ill.
Fred M. Prescott Steam Pump Co., Milwaukee Wis.
Hall Steam Pump Co., Pittsburg, Pa
Southwark Foundry & Machine Co., Philadelphia, Pa.
Punches—
E. Konigslow & Bro. Cleveland, O.
Pyrometers—
Edward Brown, Philadelphia, Pa.
Vulcan Mfg. Co., Pittsburg, Pa.
Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland, O.
Garden City Sand Co., Chicago, Ill.
Rivets—
Champion Rivet Co., Cleveland, O.
Jonse & Laughlins, Ltd., Pittsburg, Pa.
Riveted Steel Pipe—
The Wm. B. Pollock Co. Youngstown, O.
Rock Drills—
Sand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.

Rolling Mill Machinery.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
F. R. Phillips' Sons Co., Philadelphia, Pa.
Roots—
Shiffler Bridge Co., Pittsburg.
Riter-Conley Mfg. Co., Pittsburg, Pa.
Sand and Chill Rolls—
Seaman, Sleeth Co., Pittsburg, Pa.
Saws—
Peter Gerlach & Co., Cleveland, O.
Screens for Coal Ore, Etc.
Robt. Aitchison Perforated Metal Co., Chicago.
Harrington & King Perforating Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.
Screws—
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O.
Chicago Screw Co., Chicago, Ill
Screw Machines—
Cleveland Ball & Screw Co., Cleveland, O.
Seamless Tubes—
Shelby Steel Tube Co., Cleveland, O.
Separators—
Harrison Safety Boiler Works, Philadelphia, Pa.
Austin Separator Co., Detroit, Mich.
Shafting—
The Lane & Bodley Co., Cincinnati, O.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
Fitzsimmons & Co., Cleveland, O.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlins, Ltd., Pittsburg, Pa
I. & E. Greenwald Co., Cincinnati, O.
Shapers—
W. P. Davis Machine Co., Rochester, N. Y.
Baush & Harris Machine Tool Co., Springfield, Mass.
Fox Machine Co., Grand Rapids, Mich.
Shearing and Punching Machinery
Bertsch & Co., Cambridge City, Ind.
Fox Machine Co., Grand Rapids, Mich
Danielson Machine & Tool Co., Cleveland, O.
Sheet Iron—
Cleveland Rolling Mill Co., Cleveland, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
E. H. Stroud & Co., Chicago, Ill.
Ship Yards—
Wm. Cramp & Sons, Philadelphia, Pa.
Special Machinery—
Edwin Harrington Son & Co., Philadelphia.
Q & C Co., Chicago, Ill
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
E. Konigslow & Bro. Cleveland, O.
Wheeling Mold & Foundry Co., Wheeling, W. Va.
Danielson Machine & Tool Co., Cleveland, O.
Stand Pipes—
The Wm. B. Pollock Co., Youngstown, O.
Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford. Conn.
Steam Pipe and Boiler Covering—
C. H. Besly & Co., Chicago Ill
Steam Packing—
C. H. Besly & Co., Chicago, Ill.
Steam Pumps—
Hall Steam Pump Co., Pittsburg, Pa.
Stilwell-Bierce & Smith-Vail Co., Dayton, O.
Blakeslee Mfg. Co., Du Quoin, Ill.
Fred. M. Prescott Steam Pump Co., Milwaukee, Wis.
Edw. P. Allis Co., Milwaukee, Wis.
Southwark Foundry and Machine Co., Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.
Steam Separators—
James Bonar & Co., Pittsburg, Pa.
Austin Separator Co., Detroit, Mich.
Harrison Safety Boiler Works, Philadelphia, Pa.
Steam Shovels and Dredges—
Marion Steam Shovel Co., Marion, O.
The Bucyrus Co., South Milwaukee, Wis.
Steam Specialties—
C. H. Besly & Co. Chicago, Ill.
James Bonar & Co., Pittsburg, Pa.
Steel—
Otis Steel Co., Cleveland, O.
E. H. Stroud & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Sanderson Bros. Steel Co., Cleveland, O.
Byron H. White, Chicago, Ill.
Steel Balls—
Cleveland Ball & Screw Co., Cleveland, O.
Steel Castings—
Otis Steel Co., Cleveland, O.
Q & C Co., Chicago, Ill.
Bethlehem Steel Co., South Bethlehem, Pa.
Steel Plants—
The Wm. B. Pollock Co., Youngstown, O.
The Riter-Conley Co., Pittsburg, Pa.
Steel Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland.
Bethlehem Steel Co., South Bethlehem, Pa.
Ohio Steel Co., Youngstown, Ohio.
The Lorain Steel Co., Lorain, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
Steel Stamps and Stencils—
J. H. Fleharty & Co., Cleveland, O.
Steel Tubes—
Shelby Steel Tube Co., Cleveland, O.
Stokers—
Playford Stoker Co., Cleveland, O.
Tanks—
Enterprise Boiler Co., Youngstown, O.
Meehan Boiler & Construction Co., Lowellville, Ohio.
The Wm. B. Pollock Co., Youngstown, O.
Riter-Conley Mfg. Co., Pittsburg, Pa.
The Aultman Co., Canton, O.
Tank Cars—
The Wm. B. Pollock Co., Youngstown, O.
Tin and Terne Plates—
E. H. Stroud & Co., Chicago, Ill.
American Tin Plate Company, Chicago, Ill.

Tin Plate Machinery.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
F. R. Phillips' Sons Co., Philadelphia, Pa.
Tool Steel—
C. H. Besly & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa.
Sanderson Bros. Steel Co., Cleveland, O.
Transmission Machinery—
Heyl & Patterson, Pittsburg, Pa.
Link-Belt Machinery Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
W. A. Jones Foundry & Machine Co., Chicago, Ill
Jeffrey Mfg. Co., Columbus, O
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Brown Hoisting and Conveying Machine Co., Cleveland, Ohio.
Tubes—
National Tube Works, McKeesport, Pa.
Shelby Steel Tube Co., Cleveland, O.
Tube Cleaners—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.
Tube Welding—
S. Fix Sons, Cleveland, O.
Tumbling Mills—
The S. Obermayer Co., Cincinnati, O.
Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland, O.
Twist Drills—
C. H. Besly & Co., Chicago, Ill.
Twist Drill Cases—
Vulcan Mfg. Co., Pittsburg, Pa.
Valves—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City
Manning, Maxwell & Moore, New York City.
James Bonar & Co., Pittsburg, Pa.
Ventilating Fans—
B. F. Sturtevant Co., Boston Mass.
Vises—
Massey Vise Co., Chicago, Ill.
Water Softening Plants—
We Fu Go Co., Cincinnati, O.
Wire Coating—
The Ironsides Company, Columbus, O.
Wire Filler—
The Ironsides Company, Columbus, O.
Wire Machinery—
The F. B. Shuster Co., New Haven, Conn.
S. W. Goodyear, Waterbury, Conn.
Wire Nails—
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Wire Rope Coating —
The Ironsides Company, Columbus, O.
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Dodge Mfg. Co., Mishawaka, Ind.
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National Tube Works, McKeesport, Pa.

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BRÆBURN STEEL COMPANY, Bræburn, Pa.

MANUFACTURERS OF

FINE TOOL STEEL AND FORGINGS. ALSO SPRING HAMMER, AND MACHINERY STEEL OF HIGH QUALITY. FINE OPEN-HEARTH STEEL.

DIRECTORS: Wm. Metcalf, Chas. Metcalf, P. B. Hasbrouck, R. P. Kelly, Sec'y. and Treas.

MORE WEAR from your tools

.....Almost no **STEEL EXPENSE**

NO TROUBLE

"It pays to use the most reliable tool steel in the market."

SANDERSON BROS. STEEL CO.

Cleveland Warehouse, 97 Water St.

CRESCENT STEEL

ESTABLISHED 1865 ✻ INCORPORATED 1889.

CRESCENT STEEL CO.

480 PEARL ST. NEW YORK — PITTSBURGH, PA. — 64 & 66 S. CLINTON ST. CHICAGO.

La BELLE STEEL CO., Pittsburgh, Pa.

MANUFACTURERS OF FINE

CRUCIBLE CAST TOOL STEEL.

SPECIAL GRADES FOR ALL PURPOSES.

BYRON H. WHITE,

Western Selling Agent.

OFFICE AND WAREHOUSE: **68 and 70 South Canal St., Chicago.**

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"ECLIPSE" COLD DRAWN
SHAFTING
FITZSIMONS & CO. CLEVELAND, OHIO.
BYRON H. WHITE WESTERN SELLING AGENT
WAREHOUSE & OFFICE 68-70 SO. CANAL ST. CHICAGO

BYRON H. WHITE, Western Selling Agent,

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THE MORRIS & BAILEY STEEL CO. PITTSBURG, PA.
COLD ROLLED STRIP STEEL
FLAT & COILED FOR STAMPING BLANKING DRAWING SPRINGS ETC
WAREHOUSE 68 70 S. CANAL ST. OFFICE CHICAGO
BYRON H WHITE WESTERN SELLING AGENT

BYRON H. WHITE, Western Selling Agent, CHICAGO.

Don't Waste Money in Your Pattern Shop.

THE GOBEILLE PATTERN CO., Cleveland.

FOUR-NIGHT.

Cleveland Union Station.

Pennsylvania Lines.

Foot of Bank Street.

TICKET OFFICES at Station, Euclid Av., Woodland Av., and Weddell House corner.

THROUGH TRAINS RUN AS FOLLOWS BY CENTRAL TIME

*Daily. †Daily except Sunday.

xDaily except Saturday. ‡Saturdays only.

FROM CLEVELAND TO	LEAVE	ARRIVE
Pittsburgh and Bellaire	† 7:00 am	†12.10 pm
Salem and Pittsburg	* 8:00 am	* 8:30 pm
Pittsburgh, Bellaire and East	† 3:15 pm	† 6:25 pm
Philadelphia and New York	* 2:10 pm	*11:30 am
Baltimore and Washington	* 2:10 pm	*11:30 am
Alliance and Pittsburgh	* 2:10 pm	*11:30 am
Ravenna and Alliance	* 5:00 pm	* 8:45 am
Philadelphia and New York	*11:10 pm	* 4:30 am
Baltimore and Washington	*11:10 pm	* 4:30 am
Alliance and Pittsburgh	*11:10 pm	* 4:30 am

Mt. Vernon and Pan-Handle Route

FROM CLEVELAND TO	LEAVE	ARRIVE
Columbus and Cincinnati	* 8:35 am	* 5:40 pm
Indianapolis and St. L.	* 8:35 am	* 5:40 pm
Millersburg and Akron	† 3:15 pm	†12:10 pm
Col., Cin., Ind. & St. L.	x7:40 pm	*7:30 am

The Chemical Analysis of Iron.

A Complete Account of all the best-known Methods for the Analysis of Iron, Steel, Pig Iron, Iron Ore, Lime-stone, Slag, Clay, Sand, Coal, Coke, and Furnace and Producer Gas. By ANDREW ALEXANDER BLAIR. **New (Third) Edition.** Illustrated. 8vo. Half Morocco, $4.

The reputation which this book has won for itself in the estimation of analytical chemists will be increased by the many improvements in the **Third Edition**

Sent postpaid on receipt of price by

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27 Vincent St., Cleveland, O.

PETER GERLACH & CO.,

MAKERS OF

Saws Tools and Machinery

Office and Warerooms, 28 Columbus St.

Factories on Columbus, Winter and Leonard Sts.

Cleveland, Ohio, U. S. A.

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All standard and special grades.
In sectional molds or bars.

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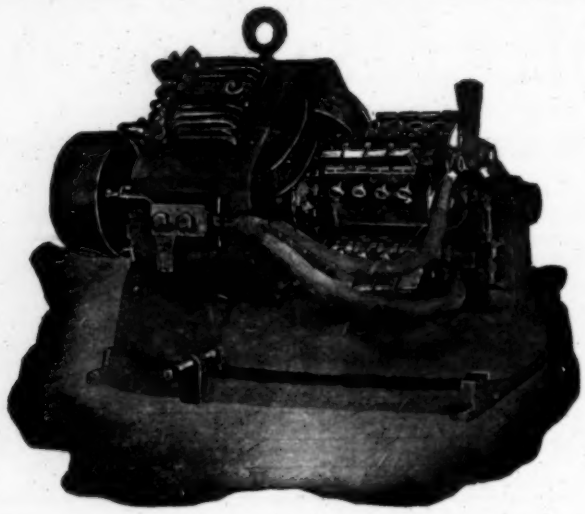
Wrtte us for prices always. It will pay you.

Eddy Dynamo Electro-Plating Machines

— FOR —

BICYCLE PLATING PLANTS.



NORTHAMPTON EMERY WHEEL CO., 20 S. Canal St., Chicago, Ill.

EXCLUSIVE WESTERN SELLING AGENTS.

The
National Engraving Co.

204 Superior St.
CLEVELAND,
OHIO.

Advertisers who "keep everlastingly at it" win success.
That is the testimony of the shrewdest and livest of them.

IRON AND STEEL MARKETS.

IRON ORE.

[On Lake Erie Docks.]

Special low-phosphorous hard ore, Bessemer		$4 50
No. 1 Specular, Bessemer	$3.50@	4.35
No. 1 Bessemer, hematite	3.00@	4 05
Hematites No. 1 n n-Bessemer	2.25@	2.70
No. 1 Specular, non-Bessemer	2.50@	7.75
Mesabi Bessemer	2.50@	3.00

PIG IRON.

Cleveland (f. o. b. cars):

Bessemer		$18.65
No 1 Strong Foundry	$17 75@	18.75
N . 2 Strong Foundry	17.25@	18.25
Gray Forge. red short	16.00@	16.50
No. 1 American Scotch	17.75@	18.75
No 2 American Scotch	17.50@	18.50
Lake Superior Charcoal	19.00@	20.00

OLD RAILS AND SCRAP METAL.

[Delivered Cleveland.]	Gross Tons.
Old iron rails	$20.00
Old steel rails (6 ft. and over)	15.00
Old steel rails (6 ft. and under)	15.00
Old car wheels	16.00
	Net Tons.
No. 1 R. R. wrought scrap	$16.50
Mill scrap	11 50
No. 1 Ma hine cast scrap	13.00
Iron axles	19 00
Axle turnings	11.00
Wrought turnings (free from cast)	10.00
Cast borings	9.00
Uncut wrought iron boilers	7 00
Steel boiler plates	11.00
Grate bars	8.00
Pipes and flues (clean)	10.00
Tank Iron	12.00
Hoop and band iron	9.00
Sheet iron	8.00
Wrought drillings	10.00
Malleable iron	10.50

STRUCTURAL MATERIAL.

Beams and channels (f. o. b. Cleveland)		1.85c
Angles	1.85@	1.95c
Tees		1.90c
Universal plates	2.25@	2.50c
Sheared plates		2 40c

MERCHANT IRON & STEEL.

[Less than car-lots, Cleveland.]

Rounds and Squares—Bar Iron.

1 to 1⅞	1.85 Base.
2 to 2⅞	.20 extra.
3 to 3½	.50 "
3⅝ to 4	.80 "
4⅛ to 4½	1.00 "
4⅝ to 5	1.30 "
5⅛ to 6	1.80 "
6⅛ to 6½	2.20 "
6⅞ to 7⅛	2.50 "
⅛ to ⅜	.10 "
7-16 to 11-16	.20 "
½ to 9-16	.30 "
7-16 to 15-32	.40 "
½ to 13-32	.50 "
5-16 to 1 -32	.70 "
⅝ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron.

1¼ to 4 x ⅛ to 1	1.05 Base
4¼ o 6 x ⅛ to 1	.10 extra
6¼ o 8 x ⅛ to 1	.60 "
8¼ o 10 x ⅛ to 1	.80 "
1⅛ o 4 x 1 1-16 to 1¼	.30 "
4¼ to 6 x 1 1-16 to 1¼	.40 "
6¼ to 8 x 1 1-16 to 1¼	.60 "
8¼ to 10 x 1 1-16 to 1¼	.90 "
2 to 4 x 1⅛ to 2	.50 "
4¼ to 6 x 1⅛ to 2	.60 "
6¼ to 8 x 1⅛ to 2	.80 "
8¼ to 10 x 1⅛ to 2	1.00 "
2to 4 x 2⅛ to 3	.60 "
4¼ to 6 x 2⅛ to 3	.80 "
6¼ to 8 x 2⅛ to 3	1.00 "
1⅛ to 1¾ x ⅜ to 1	.10 "
1 to 1 1-16 x ⅜ to ⅝	.20 "
¾ to 15-16 x ⅜ to ¾	.40 "
⅞ to 11-16 x ⅜ to ⅝	.50 "
⅞ to 9-16 x ¾ to ⅝	.90 "

Heavy Band Iron.

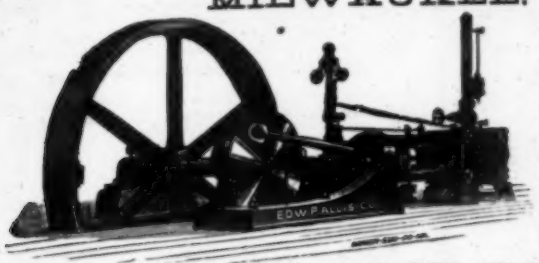
7 to 10 x ¼ to 5-16	.70 extra.
6¼ to 6¾ x ¼ to 5-16	.50 "
4¼ to 6 x ¼ to 5-16	.30 "
1⅛ to 4 x ¼ to 5-16	.20 "
1 to 1¾ x ¼ to 5-16	.30 "
¾ to 15-16 x ¼ to 5-16	.50 "
⅞ to 11-16 x ¼ to 5-16	.80 "
⅛ to 9-16 x ¼ to 5-16	1.00 "
⅞ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. **Bevel Edge Shaft Iron** 1-10 higher than same size of Heavy Bands.

Light Band Iron.

7 to 8 x No. 9 to 3-16	.90 extra
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¾ x No. 9 to 3-16	.70 "
6¼ to 6¾ x Nos. 10, 11 and 12	.80 "
4¼ to 6 x No. 9 to 3-16	.50 "
4¼ to 6 x Nos. 10, 11 and 12	.60 "
1¼ to 4 x No. 9 to 3-16	.40 "
1¼ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos. 10, 11 and 12	1.10 "

THE EDWARD P. ALLIS COMPANY
MILWAUKEE, WIS.



MANUFACTURERS OF

Blowing Engines, Hoisting Engines, Pumping Engines Air Compressors, Special Engines for Electric Lighting Street Railways and Rolling Mills, Ore Crushers, Crushing Rolls, Stamp Mills Concentrators, General Mining Milling and Smelting Machinery.

Reynolds Corliss Engines.

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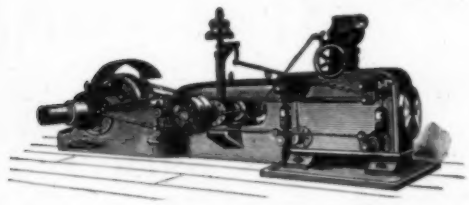
Southwark Foundry & Machine Co.
PHILADELPHIA, PA.

Porter-Allen Automatic Engines,
Blowing Engines, Centrifugal Pumps,
Weiss Counter-Current Condensers.

THE LANE & BODLEY CO.,
CINCINNATI, OHIO.



Engines,
ALL SIZES.

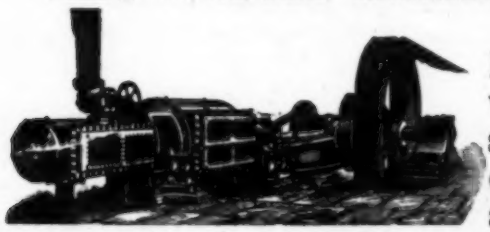
Simple and Compound.

Shafting, Hangers, Pullevs.

Belt Elevators, Saw Mills.

WILLIAM TOD & CO.
YOUNGSTOWN, OHIO.

The Porter-Hamilton Engine



Reversing Engines, Blowing Engines, Converters, Hydraulic and special heavy machinery for the iron and steel trades.

Park Building, Pittsburg.
SEWARD S. BABBITT.

The Geo. B. Sennett Co., Youngstown, Ohio,

MANUFACTURERS OF

Sennett Compression Coupling

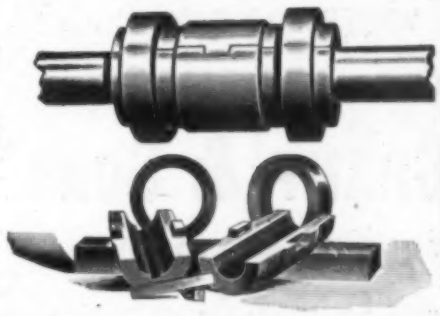
And Other Specialties.

We do not claim novelty in these Couplings so much as good material, good workmanship and extreme simplicity. We make them of a very strong cast iron, with wrought iron bands.
We make also the

SENNETT ENGINE

20 to 40 H. P.

Foundry contracts solicited for duplicate castings, from 10 lbs. to 5 tons each.



The Iron Trade Review

Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests. Per year **$3.00.**

7-16 to ½ x No. 9 to 3-16	1.30 extra
7-16 to ½ x Nos. 10, 11 and 12	1.40
⅝ x No. 9 to 3-16	1.30
⅝ x Nos. 10, 11 and 12	1.60

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in.

Sand Band Iron, 1-10 c. above same sizes of Light Bands.

Oval Iron.

⅜ to 1⅜	.40 extra
⅜ to 13-16	.50 "
½ to 11-16	.60 "
½ to 9-16	.80 "
⅝ to 7-16	1.10 "
⅝ to 9-16 x 3-16	1.00 "
⅝ to 11-16 x ⅜	1.20 "

Half Oval and Half Round.

2¼ to 3	.60 extra
⅞ to 2	.50 "
¾ to 13-16	.70 "
⅝ to 11-16	.90 "
½ to 9-16	1.20 "
⅜ to 7-16	2.50 "
5-16	3.50 "
¼	4.90 "

Half Ovals less than ¼ their width in thickness extra price.

Horse Shoe Iron.

All sizes 1 c. extra.

Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

Steel Bands.

Width In Inches.	English Standard Gauge.	
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16 "	1.50 Base.
		Extras.
1¼ to 6,	" 10, 11, 12 or 14"	.05 per 100 lbs.
1 to 1¼,	" 7, 8, 9 or 3-16"	.10 "
1 to 1¼,	" 10, 11, 12 or 14"	.15 "
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20 "
13-16 and ⅞,	" 10, 11, 12 or 14"	.25 "
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30 "
11-16 and ¾,	" 10, 11, 12 or 14"	.35 "
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40 "
9-16 and ⅝,	" 10, 11, 12 or 14"	.45 "
½,	Nos. 7, 8, 9 or 3-16"	.55 "
½,	" 10, 11, 12 or 14"	.60 "
7-16	" 7, 8, 9 or 3-16"	.75 "
7-16	" 10, 11, 12 or 14"	.85 "
⅜,	" 7, 8, 9 or 3-16"	.95 "
⅜,	" 10, 11, 12 or 14"	1.05 "

Iron and Steel Hoops.

Width Inches.	English Standard Gauge.	
7-16 to 3	Nos. 13, 14, 15 and 16	1.60 Base
		Extras.
7-16 to 2,	" 17, 18, and 19	.05 per 100 lbs
7-16 to 2,	" 20	.10 "
7-16 to 2,	" 21	.15 "
7-16 to 1¾,	" 22	.25 "
½ to 1¾,	" 13, 14 and 15	.05 "
[illegible]	[illegible]	.10 "
1¾ to 1⅞,	" 19 and 20	per 100 lbs.
1¾ to 1¾,	" 21	.20 "
1¾ to 1¾,	" 22	.30 "
15-16 and 1,	" 13, 14 and 15	"
15-16 and 1,	" 16, 17 and 18	.15 "
15-16 and 1,	" 19 and 20	.30 "
15-16 and 1,	" 21	.25 "
15-16 and 1,	" 22	.35 "
⅞,	Nos. 13, 14 and 15	.30 "
⅞,	" 16, 17 and 18	.35 "
⅞,	" 19 and 20	.50 "
⅞,	" 21	.35 "
⅞,	" 23	.45 "
¾ and 13-16	Nos. 13, 14 and 15	.30 "
¾ and 13-16	" 16, 17 and 18	.35 "
¾ and 13-16	" 19 and 20	.40 "
¾ and 13-16	" 21	.45 "
¾ and 13-16	" 22	.50 "
¾ and 13-16	" 23	.60 "
11-16,	Nos. 13, 14 and 15	.35 "
11-16,	" 16, 17 and 18	.40 "
11-16,	" 19 and 20	.50 "
11-16,	" 21	.60 "
11-16,	" 22	.70 "
11-16,	" 23	.80 "
⅝,	Nos. 13, 14 and 15	.40 "
⅝,	" 16, 17 and 18	.45 "
⅝,	" 19 and 20	.55 "
⅝,	" 21	.65 "
⅝,	" 22	.75 "
⅝,	" 23	.85 "
9-16,	" 13, 14 and 15	.45 "
9-16,	" 16, 17 and 18	.50 "
9-16,	" 19 and 20	.60 "
9-16,	" 21	.70 "
9-16,	" 22	.80 "
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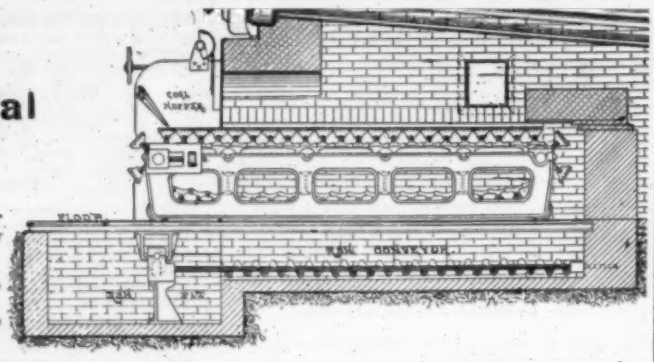

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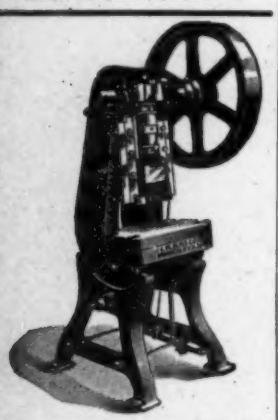

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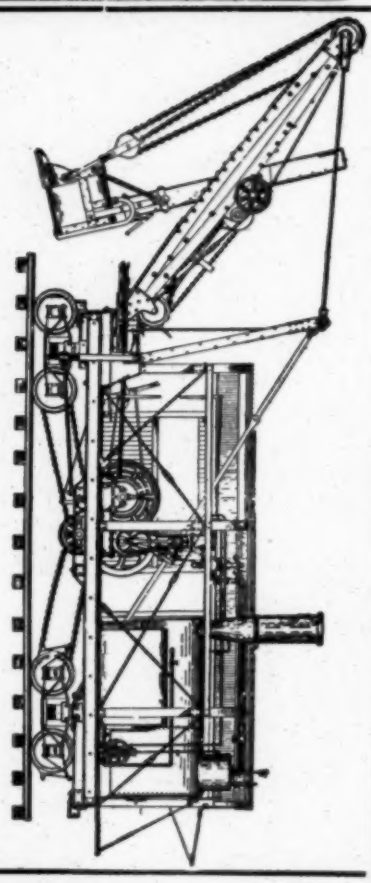

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